# Carbonised seeds in the Gumelnița settlement of Geangoești

Ana ILIE*, Marin CÂRCIUMARU**

***Abstract:*** *The article deals with the results of the carpological analysis conducted on several older samples and particularly on a consistent batch of seeds found during the archaeological excavations carried out in 2019 in dwelling 4 of Geangoești, attributed to the Gumelnița culture. The caryopses recovered from vessel 118 are the most numerous and, to an overwhelming extent, have been attributed to the* Triticum dicoccum *species, and much less to the species* Hordeum vulgare nudum *and* Pisum sativum*. Barley had been attested in this settlement following the study of samples of already studied seeds. The species of seeds found in the Chalcolithic of Geangoești have been presented within the context of their attestation in the earliest settlements of Eurasia and those belonging to the Gumelnița culture in the Romanian territory. Furthermore, there have been attempts to suggest the various uses of barley, considering some finds in this regard in Romania.*

***Rezumat:*** *Articolul prezintă rezultatele analizei carpologice asupra unor mostre mai vechi și în mod special a unui lot consistent de semințe descoperit prin săpăturile arheologice din anul 2019 în locuința 4 de la Geangoești, atribuită culturii Gumelnița. Cariopsele recuperate din vasul 118 sunt cele mai numeroase, fiind atribuite într-o proporție covârșitoare speciei* Triticum dicoccum*, iar mult mai puțin speciilor* Hordeum vulgare nudum *și* Pisum sativum*. Orzul fusese atestat în această așezare prin studiul unor probe de semințe deja studiate. Speciile de semințe descoperirile în nivelul eneolitic de la Geangoești au fost prezentate în contextul atestării lor în așezările cele mai timpurii din Eurasia și a celor din cultura Gumelnița pe teritoriul României. De asemenea, pentru orz s-a încercat sugerarea modului de utilizare, avându-se în vedere unele descoperiri în acest sens în România.*

***Keywords:*** *Chalcolithic, the Gumelnița culture, carpology, tell, dwelling, carbonised bread.*

***Cuvinte cheie:*** *eneolitic, cultura Gumelnița, carpologie, tell, locuință, pâine carbonizată.*

## ◈ Introduction

Macroscopic organic finds in prehistoric sites located in areas with temperate continental climate are quite rare. There are a multitude of factors which contribute to the degradation and destruction of organic materials and products, such as the soil activity of micro- and macro-mammals, biological oxidation, soil acidity, levigation processes, agricultural and humus maintenance works, pluviometric variations etc. (M. Kibblewhite *et alii* 2015). Tells are an exception, because provide the opportunity to discover various organic remains due to some significant anthropic deposits, the use of clay as a building material, the custom of burning dwelling structures, the storage of household waste either in specially arranged places, located on the outskirts of settlements, or through dwellings. Among such

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remains, the carbonised botanical macro-residues, sometimes stored in vessels, are of particular importance. The analysis of these discoveries and the publication of data may help, often essentially, reconstitute such concerns about how those particular communities procured the food resources and got into certain culinary habits.

The tell of Geangoești-Hulă, Dâmbovița County, lies in the Dâmbovița River meadow, right below the terrace on the left side, in a sector in which the meadow widens when the river course exits the Sub-Carpathian area, more specifically at the contact of the Cândești Piedmont with the High Plain of Târgoviște (fig. 1). The meadow is wide because, in time, the river has changed its course countless times. The terrace near the tell is high, with a relative altitude of about 15 m, whereas the area at the foot of the terrace is swampy, fed by springs with low and discontinuous flows. The site is about 2 km away from the bed of the Dâmbovița River, whose current course is located at the base of the terrace on the right versant (D. Micle, A. Stavilă 2014).

### ◈ The context of finds

The 1960 archaeological excavations focused on the central part of the Geangoești-Hulă settlement and materialised by the excavation of an area of about 250 square meters (G. Mihăiescu, A. Ilie 2004). Recent studies are currently being conducted within a systematic archaeological research project, for the 2015-2022 period, entitled *Cercetări arheologice în bazinul superior al râului Dâmbovița: situl Geangoești-Hulă* ('Archaeological research in the upper basin of the Dâmbovița River: the Geangoești-Hulă site'). The aim is to reconstruct the spatial and chronological evolution of the site, the succession of anthropic activities, as well as the identification of cultural networks and contacts (O. Cîrstina *et alii* 2016).

In 2017-2019, an area of about 500 square meters, comprising the entire southern half of the settlement, was opened for excavation. This area was divided in two zones, by preserving a 2-meter-wide outlier.

The burnt dwellings in the upper levels in the southwestern quarter of the settlement were researched in the 2019 campaign (A. Ilie *et alii* 2020) (fig. 2). Dwelling 4 is the best preserved, whereas dwellings 1 and 2 were affected by many disturbances which occurred mainly after the abandonment and burning of the built structures. On the other hand, dwelling 5 was largely affected by the archaeological sections traced in 1960.

The Gumelnița tell of Geangoești-Hulă has offered many surprises in terms of the finds of organic materials, such as cords and string dolls, plant-fibre braids, probably from the roof of houses, most often carbonised. Carbonised seeds are also present and are the subject of this study.

Dwelling 4, though slightly affected post-depositionally, has largely preserved the initial aspect previous to the burning to which it was subjected, such as, among other things, a number of upset vessels on the floor next to the hearth (fig. 3).

The seeds associated to vessel 118, a bitronconic bowl with a volume of 3.3 litres, broken *in situ*, were found opposite the burning structure in dwelling 4 (fig. 4). Vessel 137 (fig. 3), which provided several carbonised seeds, was in the immediate vicinity.

The carbonised caryopses associated to vessel 118 were taken together with the sediment that was part of the house floor. Initially, the entire material, i. e. seeds, sediment, burnt adobe fragments etc., occupied a volume of 9.3 litres, but, after a first separation, there were 1,323 grams of seeds and a little less residue of sediment, charred earth etc. left.

Vessel 137 was lifted without being emptied of sediment. After the flotation carried out in the laboratory, about 10 grams of seeds and other organic residues remained.

### ◈ The carpological study

A batch of about 2,000 carbonised seeds attributed to the *Hordeum vulgare nudum* species (fig. 5/1) was identified in a level belonging to the Gumelnița B (III) culture in the settlement of Geangoești, the 'Hulă' point, many years ago (M. Cârciumaru 1996). The seeds were recovered from a pot outside dwelling A, and its dating revealed the age of 5352 ± 30 B.P. (6211-6107 cal. B.P. – 48.5 %, RoAMS 573.33). At the time, these were the only mentions regarding the agriculture of Gumelnița communities from Geangoești.

The average dimensions of the caryopses recovered are as follows: length = 5.0 mm; width = 3.1 mm; height = 1.9 mm (tab. 1).

| | Maximum | Average | Minimum |
|---|---|---|---|
| Length | 5.5 | 5.0 | 4.5 |
| Width | 3.5 | 3.1 | 2.0 |
| Height | 2.1 | 1.9 | 1.5 |

**Tab. 1.** Dimensions in mm of the *Hordeum vulgare nudum* seeds.

The 'Princely Court' National Museum Complex in Târgoviște resumed the archaeological investigations in the Geangoești tell, thus creating the premises for recovering a significant amount of carbonised seeds in certain contexts, such as the vessels attributed to this culture.

The material gathered from the site also contained some sediment and minuscule remains of pottery, adobe, plant residues etc. Most of the seeds were largely fragmented (fig. 6/1), most likely due to the flotation process.

Vessel 118 provided a significant quantity of carbonised seeds. Over 5,000 intact caryopses of *Triticum dicoccum* were separated, but their number was actually much larger, so the amount should be multiplied 3-4 times (fig. 7/1, 8). Although many of them are fragmented, they certainly belong to the same wheat species (fig. 6/2).

The largest unbroken caryopses are generally 5.9 mm long, 3.3-3.0 mm wide and 2.9-2.7 mm high. As regards those of very small sizes, the length varies between 4.0 and 3.5 mm, the width is between 2.4 and 2.2 mm and their height does not exceed 2.1 mm (fig. 8/1). Many caryopses preserve sediment impregnated on their surface, and, due to calcium carbonate precipitation, this sediment got embedded in the structure of the seed surface (fig. 8/2), whereas a small part of them suffered slight deformations. The carbonisation of seeds was medium, therefore the structure of only a few specimens was deeply affected.

31 seeds of *Hordeum vulgare nudum* were also separated in vessel 118 (fig. 5/2), having similar morphology and dimensions to those already mentioned in another context in the Geangoești settlement (fig. 5/1).

The list of species in this vessel is completed by 5 carbonised seeds of *Pisum sativum* cf. ssp. *arvense* (fig. 9/1). Their diameter ranges from 4.0 to 4.6 mm.

Only 4 seeds of *Pisum sativum* cf. ssp. *arvense* (fig. 9/2), 2 *Triticum dicoccum* caryopses and about 15 undetermined seeds were found in vessel 137.

In addition, 10 seeds of *Pisum sativum* cf. ssp. *arvense* (fig. 9/3) and only one *Hordeum vulgare nudum* seed were gathered from the floor of that dwelling, between vessel 118 and vessel 137.

In conclusion, through recent research, it has been possible to add a second cereal of the *Triticum* genus, the *dicoccum* species, to the only one known until recently in the settlement of Geangoești, namely that attributed to the *Hordeum vulgare nudum*. Moreover, the first species of legumes, the *Pisum sativum*, most likely the *arvense* subspecies, was attested. The significant

amounts of seeds of *Hordeum vulgare nudum* and *Triticum dicoccum* entitle us to believe that these two species of cereals were systematically grown by the members of the Gumelnița community near the Geangoești settlement.

### ◈ Discussions

*Triticum dicoccum* is the best represented species in the Gumelnița settlement of Geangoești. As is known, it is one of the most common species in the early settlements of the Near East. It is also present at Beidha in Jordan, Catal Hüyük and Hacilar in Anatolia, Ali Kosh in Iran, Ghediki and Achilleion in Thessaly etc. (H. Helbaek 1959, 1964, 1966a; J.M. Renfrew 1969). In Romania, carbonised seeds of *Triticum dicoccum* were found in the Vinča culture at Liubcova and Parța; it was described in the settlements of Hârșova and Vlădiceasca in the Boian culture; this species is widespread in the Boian-Gumelnița transition period, as found in the settlements of Radovanu, Ipotești and Izvoarele. As regards the Pre-Cucuteni, significant amounts were found at Poduri, where, alongside the *Triticum aestivum*, it was the most important cereal (M. Cârciumaru 1996; F. Monah 1999). As for the Gumelnița culture, *Triticum dicoccum* carbonised seeds were mentioned at Bordușani (R. Hovsepyan 2008), Hârșova (F. Monah, 1999; R. Hovsepyan *et alii* 2020), Lișcoteanca (M. Cârciumaru 1996).

The second cereal species identified is the *Hordeum vulgare nudum*. The earliest attestations of this species are those in the aceramic settlements of Hacilar and Catal Hüyük in Anatolia (J.M. Renfrew 1973). In Romania, this species is encountered starting with the Vinča culture at Parța, at Grădiștea Ulmilor in the Boian culture and at Poduri, the Pre-Cucuteni, where it was highly valued by those communities. As regards the Gumelnița culture, the *Hordeum vulgare nudum* is mentioned in the eponymous settlement attributed to this culture (M. Cârciumaru 1996), Hârșova (R. Hovsepyan *et alii* 2020), Bordușani (R. Hovsepyan 2008); it is also present in the settlements of Frumușica and Bălăneasa, the Cucuteni culture. In the Sălcuța culture, it was certainly grown by the communities of Curmătura and Valea Anilor (M. Cârciumaru 1996).

There have been many hypotheses and arguments regarding the use of barley in prehistoric times, including its role in the preparation of beer as early as the 6$^{th}$ century CE in Sweden and the 1$^{st}$ century CE in Denmark (H. Helbaek 1966b; J.M. Renfrew 1969).

As regards the Romanian territory, we should note the use of barley for the preparation of bread. One of the earliest mentions is the discovery of carbonised bread remains in a pit arranged in a dwelling dated to the period of transition from the Chalcolithic to the Bronze Age in the tell of Sucidava-Celei (*Celei cultural aspect*), for which there is a date, namely C-14: 4225 ± 60 B.P. (B1n 2014). The carbonised bread remains were in the form of an aggregate about 1-1.5 cm thick and 15-20 sq. cm. Following the fragmentation of a small quantity, 22 integral barley seeds (*Hordeum vulgare*), 3 dock seeds (*Rumex crispus*) and one flax seed (*Linum usitatissimum*) were recovered (fig. 10). The presence of the intact barley seeds may be the consequence of their being used to obtain an ingredient necessary for the preparation of bread, more specifically some kind of leaven that helped with the fermentation (M. Cârciumaru 1996). In fact, halves of barley seeds were recovered from the 'buns' found in the lake settlements in Switzerland, such as Robenhausen or Wangen (J.M. Renfrew 1973). As this discovery dates to the period of transition from the Chalcolithic to the Bronze Age, one might assume that such practices regarding the use of barley may be rooted precisely in the Chalcolithic and, why not, in the Gumelnița culture communities.

Barley probably had a symbolic role for those communities because barley spikes were found lying at the base of a pillar supporting another dwelling in that particular tell (M. Cârciumaru 1983, 1996).

The only legume found so far in the settlement of Geangoești belongs to the species *Pisum sativum* cf. ssp. *arvense.* It is one of the legumes known as early as 8450-7950 B.P., when it was grown in the aceramic settlement of Jarmo (Iran) (H. Helbaek 1959), at Can Hasan and Cayőnű (Turkey) (J.M. Renfrew 1968; W. Van Zeist 1972), at Tell Aswad (Syria) (W. Van Zeist and J.A.H. Bakker-Heeres 1979), Jericho (Jordan) (M. Hopf 1983) etc. Closer to our territory, the *Pisum sativum* was attested in Greece after 7450 B.P at Nea Nikomedeia (W. Van Zeist, S. Bottema 1971), as well as in the aceramic settlements of Ghediki, Sesko and Soufli (J.M. Renrew 1966; H. Kroll 1981); in Bulgaria, it occurs after 6200 B.P. at Tell Azmak (M. Hopf 1973).

In Romania, the earliest occurrence of the species *Pisum sativum* ssp. *arvense* is in the Dudești-Vinča culture at Cârcea, where the seeds were placed in a ritual stove. In the stage of transition from the Boian culture to the Gumelnița culture, the pea is documented at Radovanu, but especially at Ipotești, where significant amounts have been found, pointing to particular preoccupations with its cultivation. *Pisum sativum* seeds, not mixed with other species, have been recovered, in large quantities, from Văleni, the Cucuteni culture (M. Cârciumaru 1996).

The plant species found in the Eneolithic settlement of Geangoiești complete the image of interests of the communities attributed to the Gumelnița culture in the Romanian territory. The Geangoești tell is another Gumelnița site where *Triticum dicoccum* has been found, alongside those of Lișcoteanca, Hârșova and Bordușani. *Hordeum vulgare nudum* has also been uncovered here as well as at Gumelnița, Hârșova and Bordușani. The species *Pisum sativum* ssp. *arvense* is one of the important mentions regarding the Gumelnița culture in the Romanian territory, being the only discovery of a significant number of carbonised caryopses which attest the interest of those communities for this legume species.

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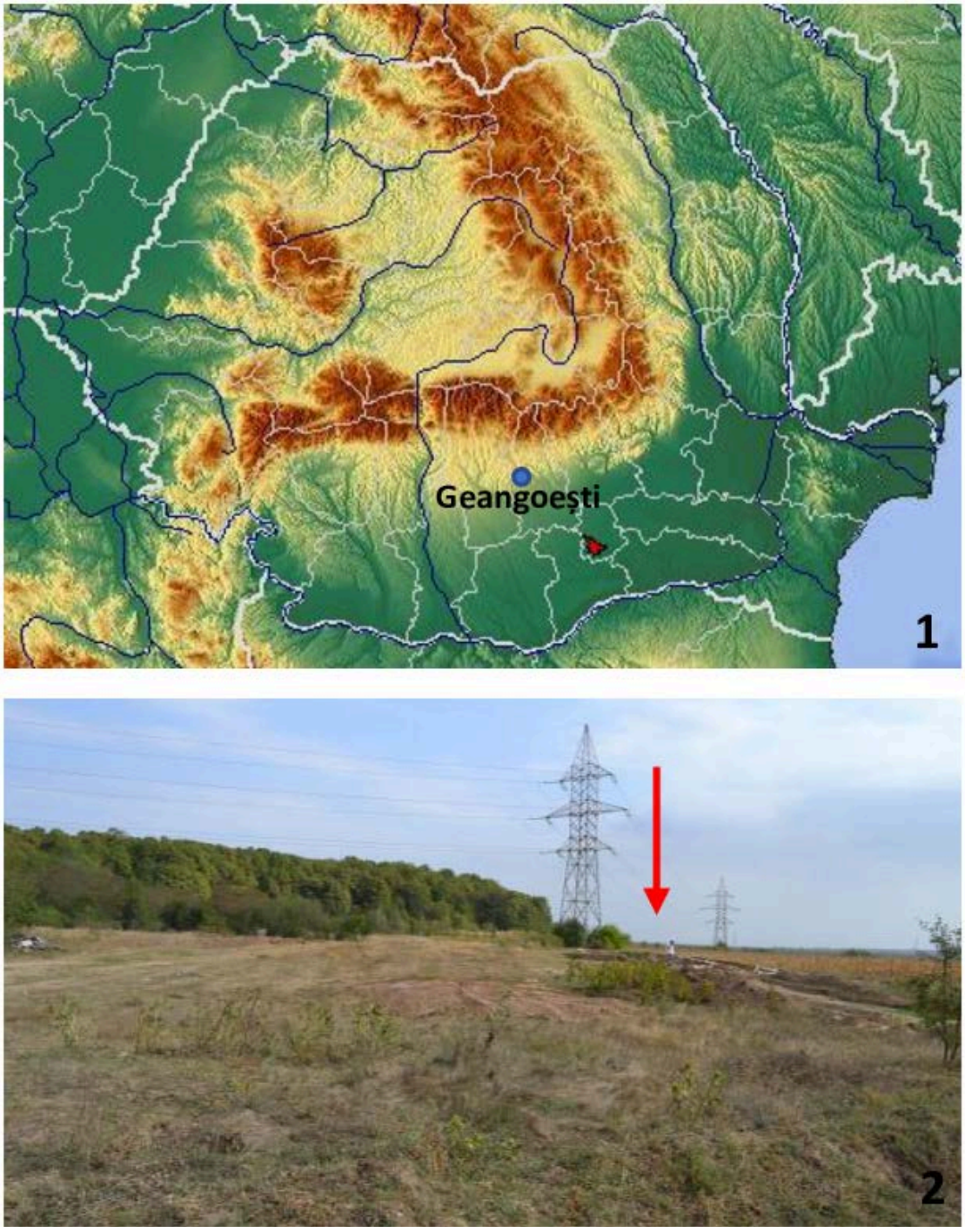


**Fig. 1.** Geographic location of the Eneolithic settlement of Geangoești.
Poziția geografică a așezării eneolitice de la Geangoești.

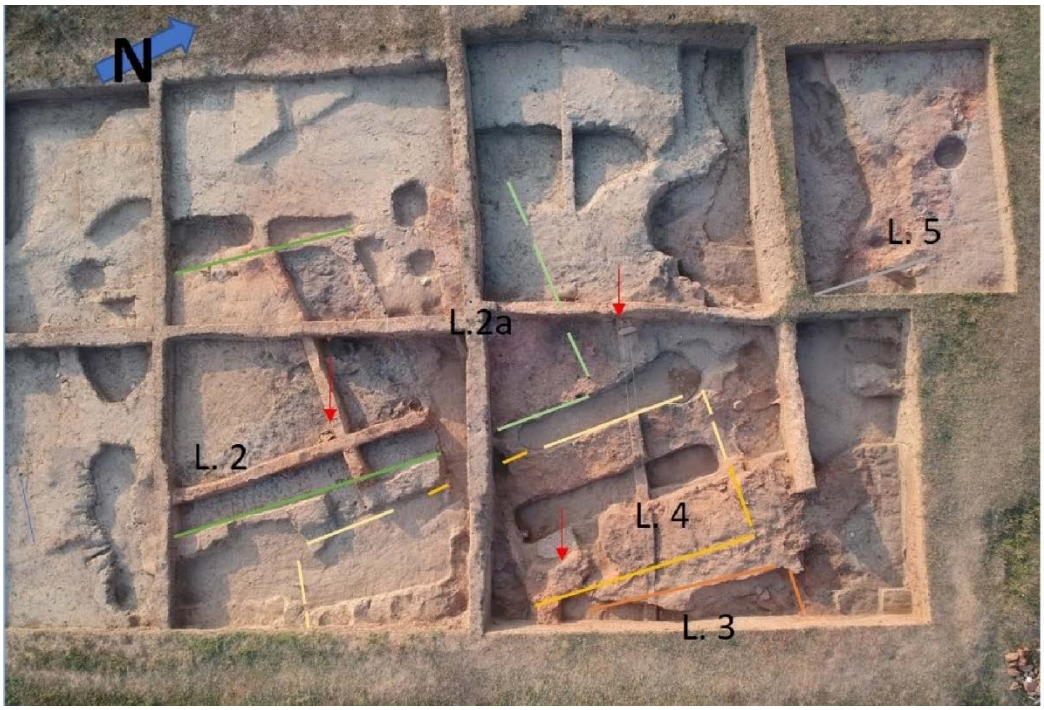


**Fig. 2.** A number of recently unveiled dwellings in the Geangoești settlement attributed to the Gumelnița culture (the arrows mark burning areas).
O serie din locuințele dezvelite recent în așezarea din cultura Gumelnița de la Geangoești (săgețile marchează zone de combustie).

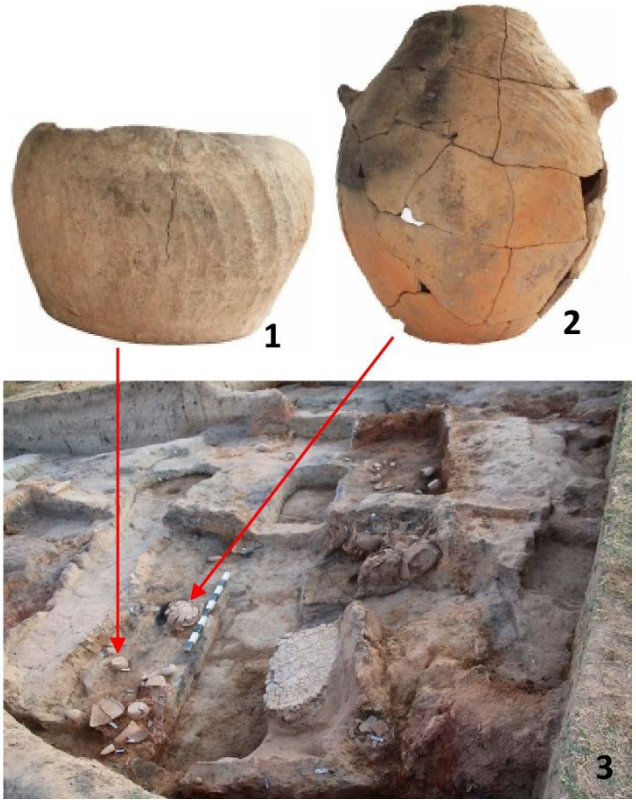


**Fig. 3.** Vessels in which carbonised seeds were kept in dwelling 4 (1 - vessel 137; 2 - vessel 118; 3 - the position of vessels in dwelling 4).
Vase în care s-au păstrat semințe carbonizate din locuința numărul 4 (1 - vasul numărul 137; 2 - vasul numărul 118; 3 - poziția vaselor în cadrul locuinței numărul 4).

**Fig. 4.** Vessel 118 and the carbonised seeds scattered near it.
Vasul numărul 118 și semințele carbonizate răspândite în preajma sa.

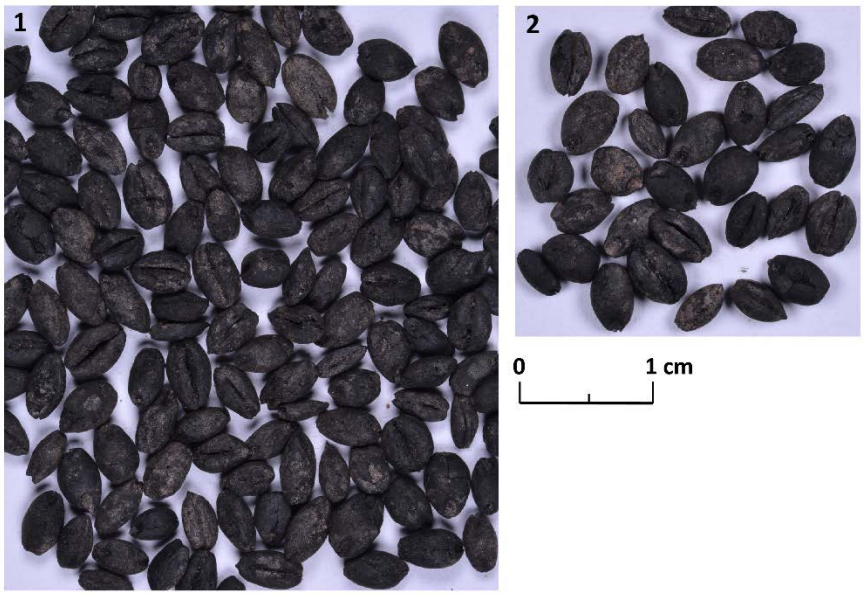


**Fig. 5.** *Hordeum vulgare nudum* in the settlement of Geangoești (1 - seeds recovered from a Gumelnița B (III) level during older excavations: 2 - seeds resulted from recent archaeological excavations - vessel 118).
*Hordeum vulgare nudum* din așezarea de la Geangoești (1 - semințe recuperate dintr-un nivel Gumelnița B (III) prin săpături mai vechi; 2 - semințe care provin din săpăturile arheologice recente - vasul nr. 118).


**Fig. 6.** Appearance of the raw material in vessel 118 before selection (1) and fragmented seeds of *Triticum dicoccum* (2) (1 - image obtained by means of the Hayer microscope; 2 - photo).
Aspectul materialului brut din vasul 118 înainte de selectare (1) și semințe fragmentate de *Triticum dicoccum* (2) (1 - imagine obținută cu microscopul Hayer; 2 - imagine foto).

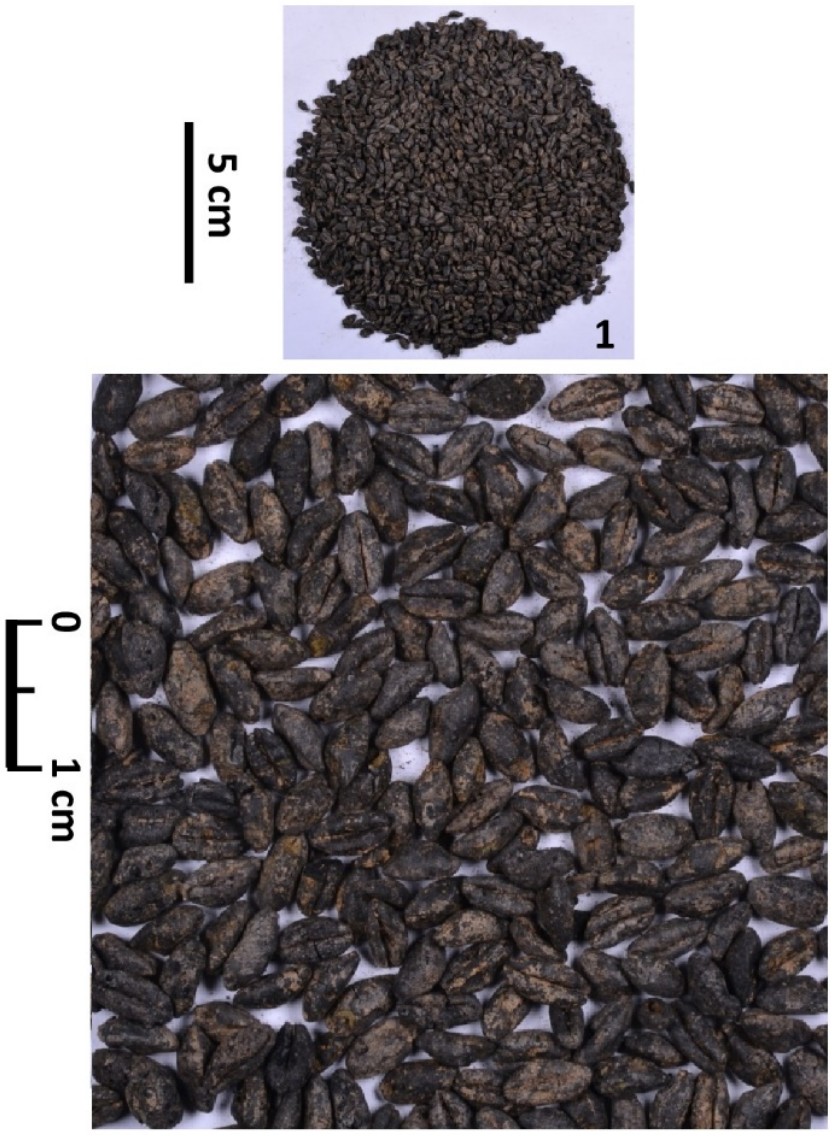


**Fig. 7.** Photos of *Triticum dicoccum* in vessel 118. 1 - overview of the approximately 5,000 caryopses; 2 - detail regarding the seed morphology.
Imagini foto cu *Triticum dicoccum* din vasul 118. 1 - privire de ansamblu a celor circa 5.000 de cariopse; 2 - detaliu privind morfologia semințelor.


**Fig. 8.** *Triticum dicoccum* caryopses of various dimensions (1) and with sediment impregnated on the seed surface (2) (images obtained by means of the Hayer microscope).
Cariopse de *Triticum dicoccum* de dimensiuni diverse (1) și cu sediment imprimat pe suprafața semințelor (2) (imagini obținute cu microscopul Hayer).


**Fig. 9.** *Pisum sativum* cf. ssp. *arvense* (1 - seeds in vessel 118; 2 - seeds in vessel 137; 3 - seeds recovered from the dwelling floor).
*Pisum sativum* cf. ssp. *arvense* (1 - semințe din vasul 118; 2 - semințe din vasul 137; 3 - semințe recuperate de pe podeaua locuinței).

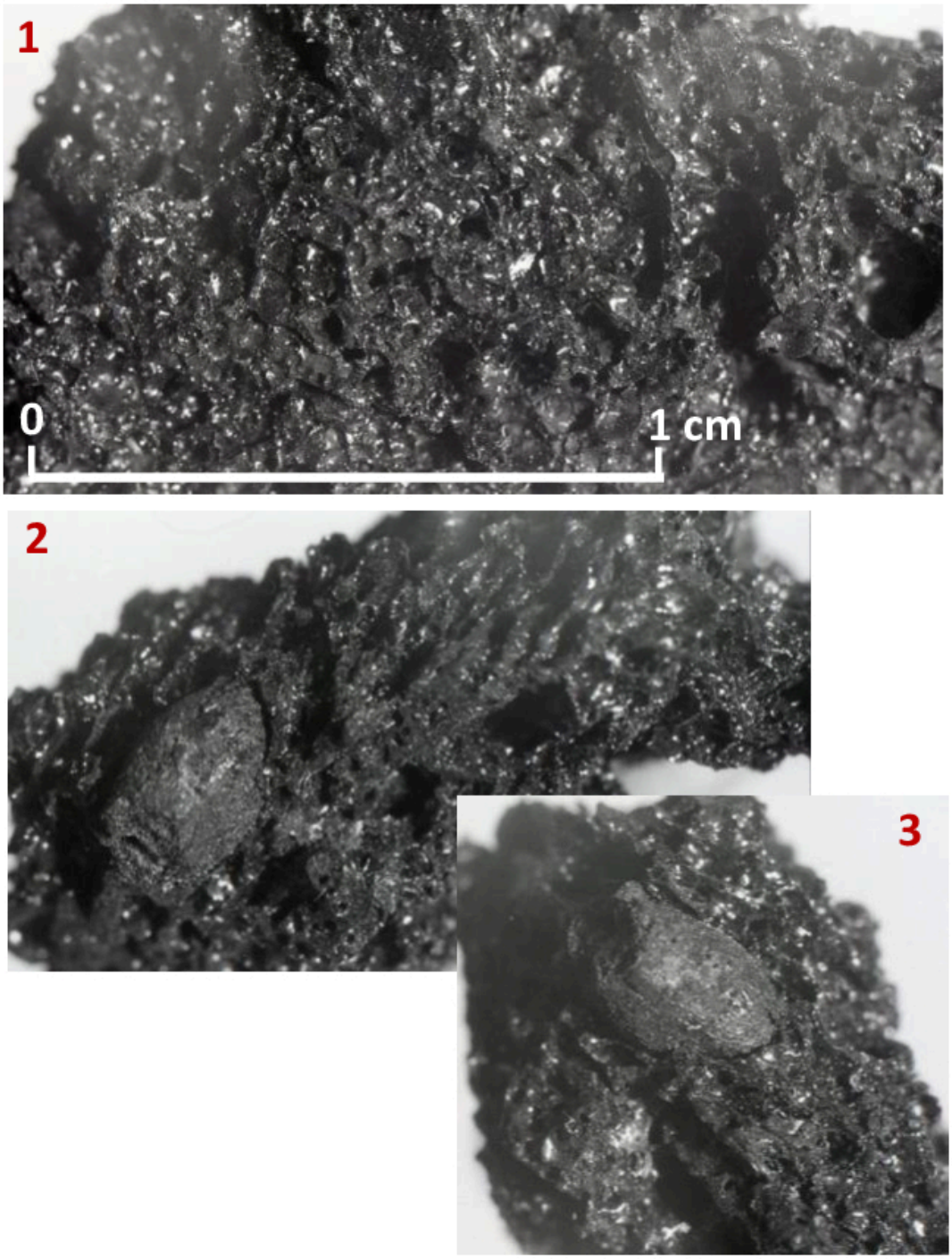


**Fig. 10.** Carbonised bread with barley seeds in its structure, found in a tell at Celei, dating to the period of transition from the Eneolithic to the Bronze Age. 1 - bread structure; 2-3 barley seed in the bread structure (after Cârciumaru 1996).
Pâine carbonizată cu semințe de orz în structura sa descoperită într-un tell din perioada de tranziție de la Eneolitic la Epoca bronzului de la Celei. 1 - structura pâinii; 2-3 sămânță de orz prinsă în structura pâinii (după Cârciumaru 1996).