

THE FIRST ARCHAEOBOTANICAL EVIDENCE OF *LAGENARIA SICERARIA* FROM THE TERRITORY OF HUNGARY.



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Introduction

Bottle gourd (*Lagenaria siceraria* (Molina) Standl.) is accepted as typical 'New World' cultivated economic plant. Currently, two subspecies are known: *L. siceraria* ((Molina) Standl.) subsp. *siceraria* has an African origin, whilst subsp. *asiatica* is recognized to be originating from Asian territories. It only seldom appears in European archaeological context, however finds from the Roman period sporadically appear.

A Late Middle Age (14th-15th cent.) settlement part was excavated near the town of Pócspetri (SE Hungary) and one of the refuse pits contained waterlogged remains of several dozen dicot leaves and small sized branches (e.g. *Populus* sp.). In addition an entire dog skeleton and an app. 10 cm by 7 cm bottle gourd pericarp fragment was found in a well-preserved pot. This fortunate recovery accounts for the first evidence of bottle gourd in the archaeobotanical record of Hungary.

Materials and methods

The multilevel identification process designed to give a precise botanical description and identification of the rind find of Pócspetri-Bikaréti szivárgó imply archaeobotanical approaches ranging from the macroscopic to the molecular level. Beside the macroscopic description of the rind, its histological properties and phytolith assemblage was studied and compared to modern reference plant material. An attempt to characterise the aDNA of the find was also undertaken. As an addition to the multilevel identification of the rind fragment, the standard macro-archaeobotanical (carpological) approach was applied to recover, identify, group and interpret the waterlogged plant remains recovered alongside with the rind fragment.

Rind thickness

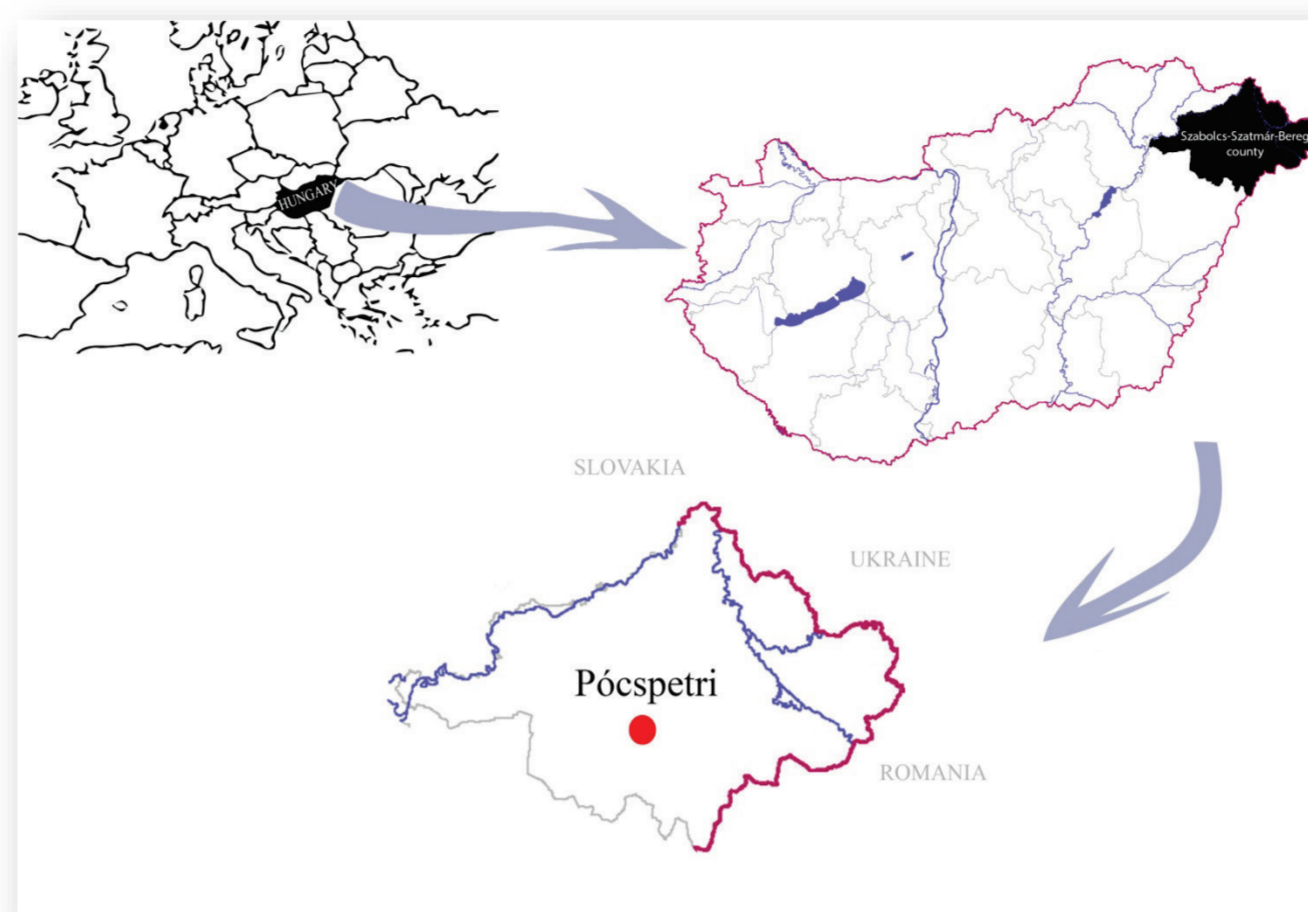
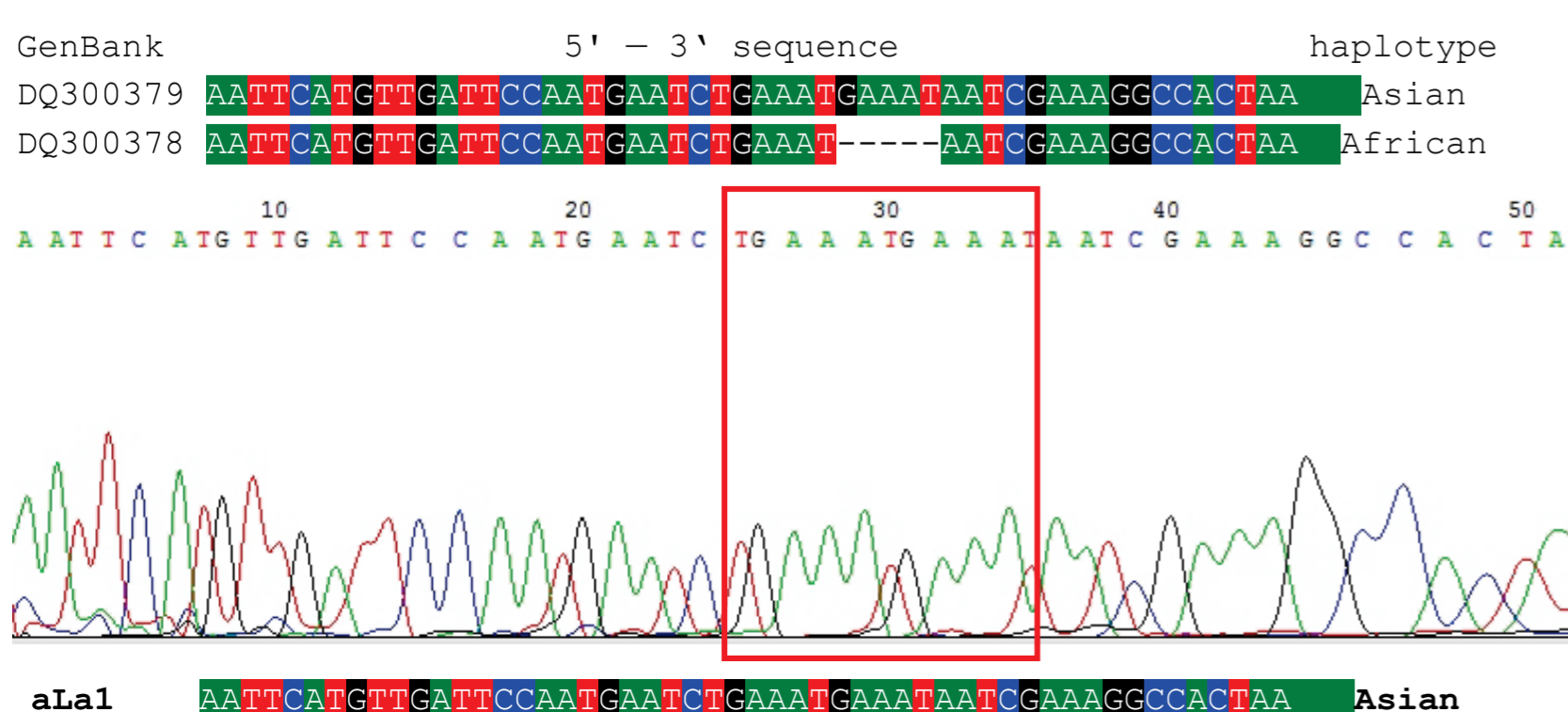
One of the main identification traits to distinguish *Cucurbita* and *Lagenaria* genera is the rind thickness. The rind thickness of the Pócspetri-Bikaréti szivárgó find was measured to alternate between 4.23 (min.) and 5.49 mm (max.). Based on the ten measurements that was taken around the rim of the find, its mean thickness value is set at: 4.80 mm. The rind thickness of bottle gourd species vary between 1.0 and 16.0 mm, while those of the *Cucurbita* genus alternates between 1.5 and 10.0 mm, however they are mostly less than 4.0 mm. It has been shown previously that wild African bottle gourds have a rind thickness varying between 1.0–1.5 mm, while the domesticated American finds show a thicker rind wall value, ranging from 3.0 to 5.0 mm.

Phytolith analysis

The bottle gourd rind (pericarp) consists of isodiametric and elongated cells arranged in more or less irregular pattern. The epicarp contains the epidermis and a thin hypodermis layer that is usually missing in the cross sections, because this part exfoliates from the rind tissue during preparation. The more or less sclerenchymatous mesocarpal layer can usually be seen in the cross sections. The sclerenchyma cells with extremely thick cell walls can be horizontally or vertically elongated, or may form smaller isodiametric cells (stone cells). The structure of the ancient rind is entirely identical, except for the sclerenchymatous cell walls of the ancient rind that was less recognisable. The mesocarp and the endocarp has a characteristic parenchymatous cell texture, which is arranged in a 'floriform' structure. This structure consists of an isodiametric cell with central position circled by bigger parenchymatous cells.

(a)DNA analysis

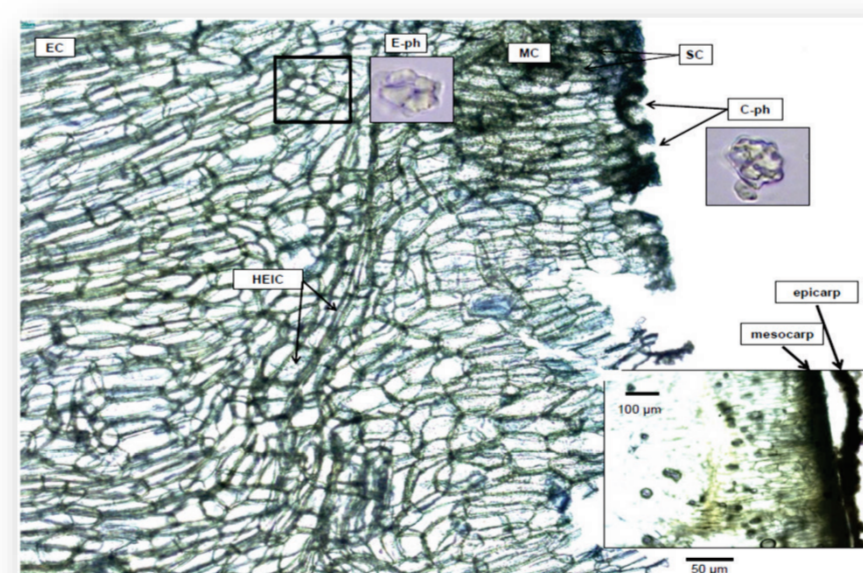
The sequence of our aDNA sample aLa1 provided an 51-bp long unambiguous read for the InDel1 region, while the reverse read gave the same length (see figure below). Although, these reads are somehow shorter than those obtained after cloning the region the diagnostic indel at the middle of the region (from 42th base to the 46th base in the 94 bp long reference sequence DQ300379) was fully and unambiguously readable in our sequence. This displayed two (GAAAT) minisatellite motives at the diagnostic part, therefore representing an insertion compared to the other haplotype, thus characterising an Asian haplotype for the analysed archaeological sample.



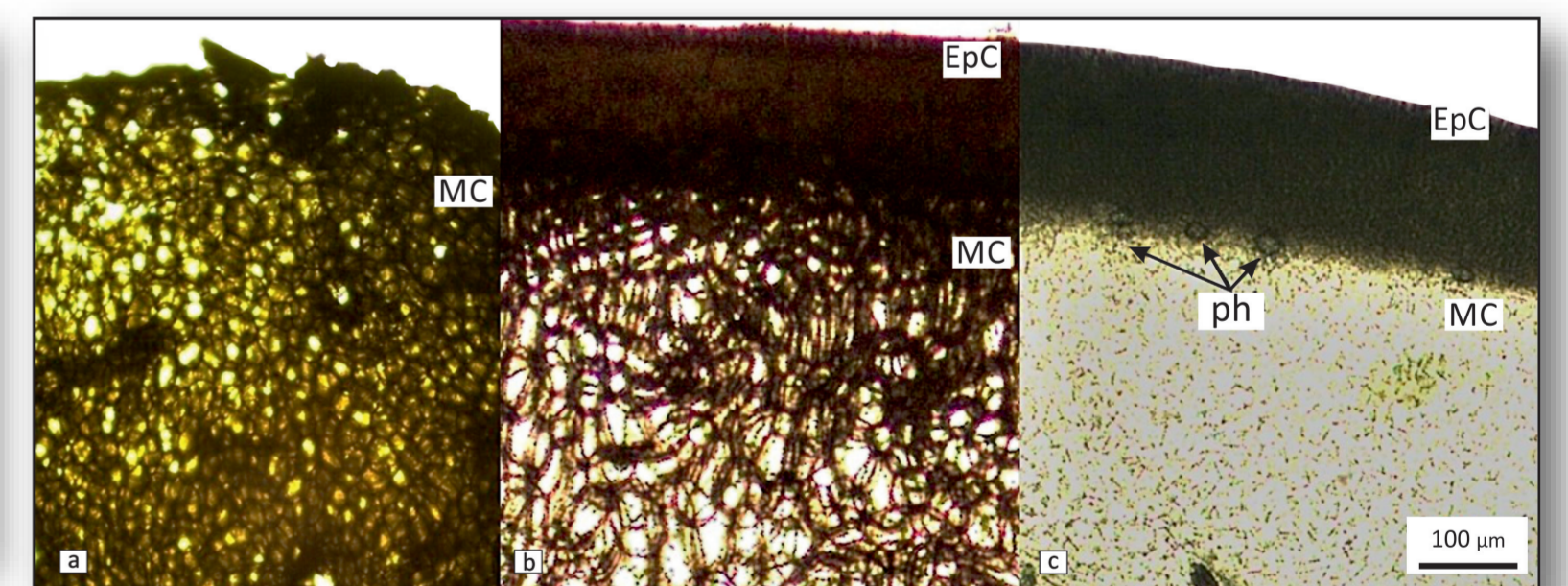
Location of Pócspetri-Bikaréti szivárgó archaeological site near the town of Pócspetri (Szabolcs-Szatmár-Bereg county, NE Hungary) (above) and on-site photograph of Feature 239/636: the pit is situated below the ground water table, which provided waterlogged environment in the feature and influenced the taphonomy of both the animal and plant remains (right).



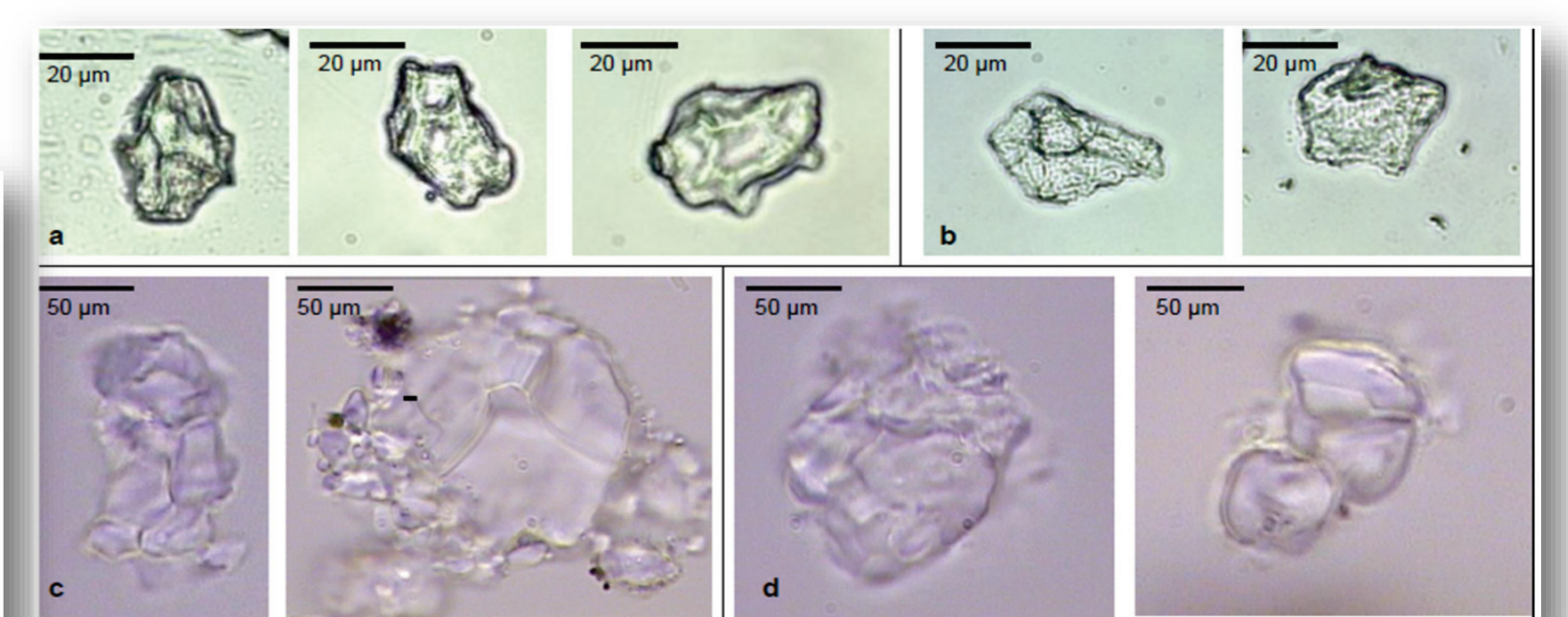
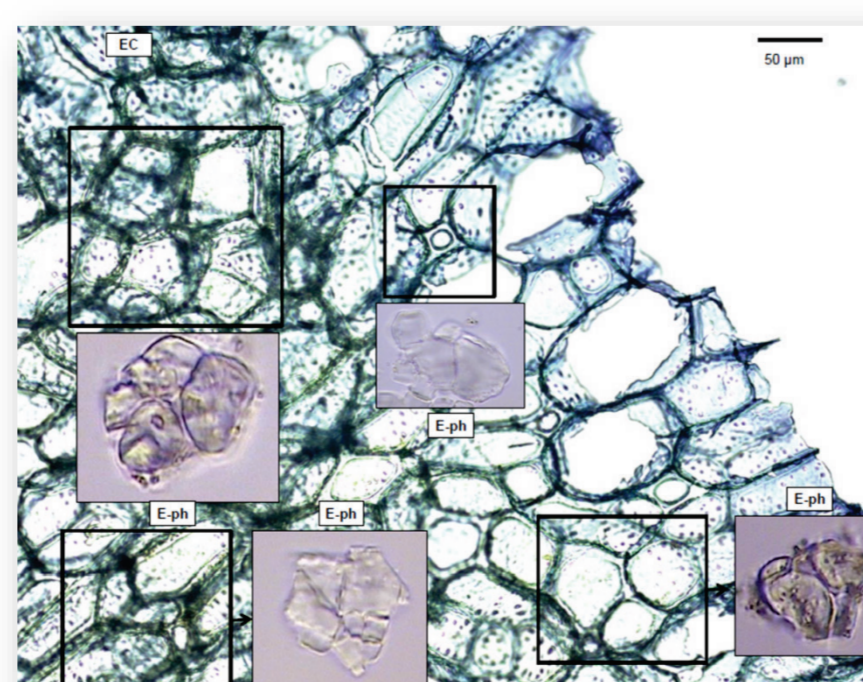
The waterlogged pericarp remain of bottle gourd (*Lagenaria siceraria* (Molina) Standl.). Imprints of dicot leaves can be seen on its outer surface (above left). Archaeobotanical remains recovered at Pócspetri-Bikaréti szivárgó. right above: 1. *Rosaceae* stalk, 2. *Cornus sanguinea* L. drupe, 3. *Viburnum opulus* L. seed, 4. *Quercus robur* L./*petraea* agg. twig, 5. *Quercus robur* L./*petraea* agg. bud, 6. *Rubus cf. caesius* L. drupe, 7. *Pyrus pyraeaster* (L.) Burskd. seed, 8. *Rosaceae* thorn (*Prunus spinosa* L., *Crataegus* sp.). right below: 1. *Stellaria* sp., 2. *Amaranthus cf. retroflexus* L., 3. *Carex* sp. type I., 4. *Carex* sp. type II., 5. *Taraxacum cf. officinale* L., 6. *Apiaceae* (*Seseli* type), 7. *Setaria pumila* (Poir.) Schult., 8. *Carex spicata* Huds., 9. *Ranunculus repens* L., 10. *Centaurea solstitialis* L., 11. *Ranunculus arvensis* L., 12. *Sambucus ebulus* L., 13. *Peucedanum alsaticum* L.



Cross section of the ancient *L. siceraria* rind. Inset: Exfoliating epicarp. notes: MC mesocarp, EC endocarp, SC sclerenchymatized cells with less staining walls, E-ph endocarpal phytolith: floriform cell structures with silicified cell walls, C-ph cavities of dropping out phytoliths, HEIC Horizontally elongated cells.



Histological comparison of a) archaeological rind find of Pócspetri-Bikaréti szivárgó; b) reference *L. siceraria* rind, c) reference *Cucurbita pepo* L. rind. notes: MC mesocarp, EpC Epicarp; ph phytolith.



Phytoliths of *L. siceraria* rind. a) recent mesocarpal phytoliths; b) ancient mesocarpal phytoliths are smaller with concave impressions; c) recent endocarpal phytoliths; d) ancient endocarpal phytoliths are bigger with floriform concave impressions.

Reference

Pető et al. The first archaeobotanical evidence of *Lagenaria siceraria* from the territory of Hungary: histology, phytoliths and (a) DNA. *Veget Hist Archaeobot*; 10.1007/s00334-016-0566-y

Acknowledgement

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