Storage practice and problems with pests
Late Neolithic site of Selevac, Serbia

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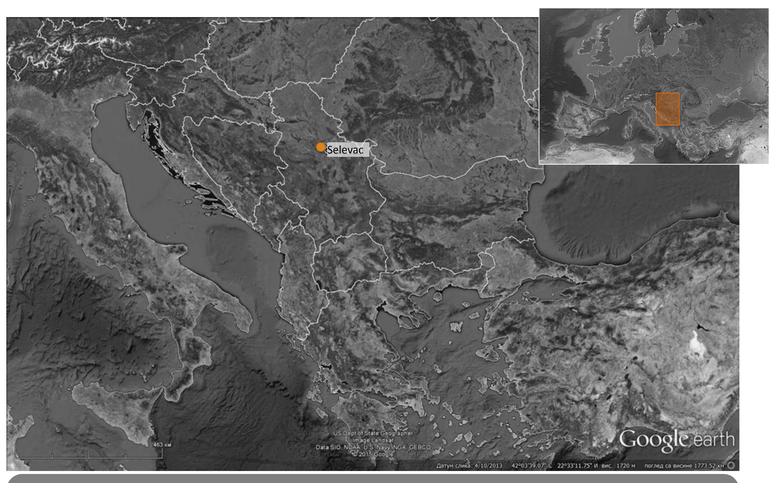

SELEVAC - a Late Neolithic settlement
(Vinča culture, *c.* 5400-4650/4550 cal BC)

Introduction

The storage units were discovered during the test excavations at Selevac site in the 1970s; the remains of three and possibly five storage containers were found, but only three that contained recognisable cereal grain were sampled. First archaeobotanical analysis of one of the storage samples was conducted by M. Hopf[1]; other samples were, until recently, curated in the Museum of Smederevska Palanka. Several researchers[1,2,3] considered the same context and offered different interpretations.

Research aims:

(1) to revise previous interpretations of the Selevac storage contexts

(2) to obtain new data on cultivation and storage practices at Selevac

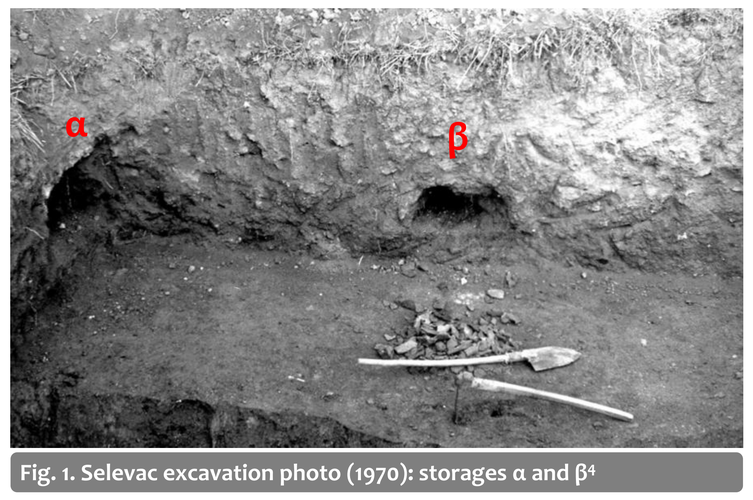

Fig. 1. Selevac excavation photo (1970): storages α and β[4]

Storage context

The excavator's report[4] contained data on the size and shape of the clay structures but lacked data on their spatial context. Subsequent interpretations varied and the researchers had several dilemmas. I have tried to resolve these issues by looking back at the unpublished excavation records.

1) Was grain stored inside clay containers located above ground[1] or in clay-lined pits[2]?

Based on the available drawings of the trench and the profiles, it was concluded that these are clay containers projecting from the burned daub level. What remains unclear is how the content was accessed. A possible opening was not mentioned in the report. M. Hopf suggested a reconstruction in which the structures were fully closed and had to be destroyed in one part in order to take the grain out (fig. 2). This remains one of the possibilities.

2) Were the storages located inside the building?

The amount of burned clay rubble found at the same level and immidiately above them would suggest that the storages were located inside a building. They were burned in a fire that consumed the entire building. It can not be ascertained whether the room was part of a dwelling or a storage facility.

3) Were the structures used for storage or for grain parching[1,2]?

The general shape of clay containers α and β resembles that of Neolithic domed ovens, but this is not sufficient for their determination. The partition wall is a particular feature that does not appear in the ovens. The strongest argument for the interpretation of the structures as storages are the characteristics of the archaeobotanical composition.

Containers **α** and **β** *are almost circular in plan and semi-elliptic in cross section. The dome was made of clay molded over wooden frame or wattling construction. They are of similar size and construction, with two differences:*
1) container **β** *had a partition wall made of clay; 2) on top of the fill of container* **α** *an anthropomorphic figurine was found.*
Storage **γ** *was recognized as a concentration of charred wheat grain. Constructional elements of the storage were not preserved; its architecture may have been different and perhaps it was made from organic materials.*
Possible storages (4 and 5) are described in the field report as concentrations of charred material, but were not sampled as they did not contain recognizable cereal remains.

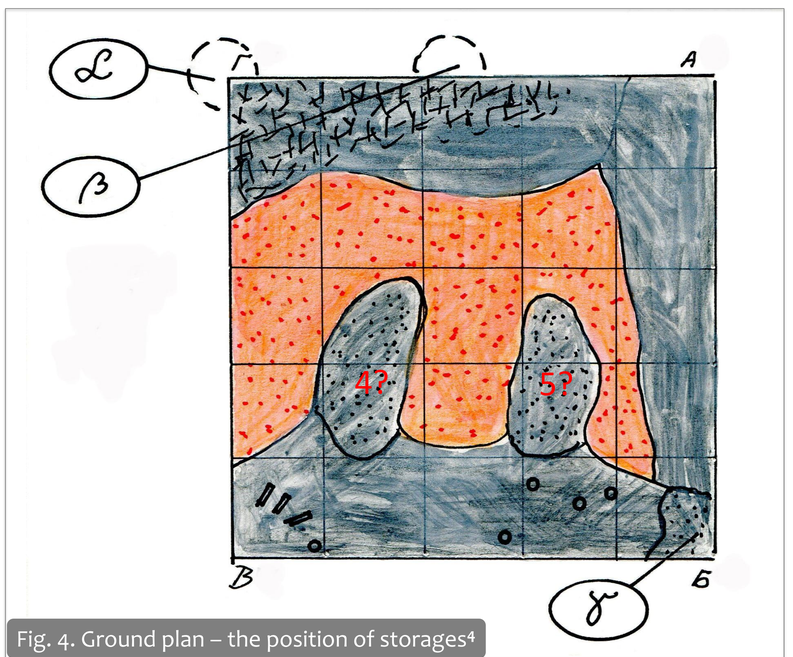

Fig. 4. Ground plan – the position of storages[4]

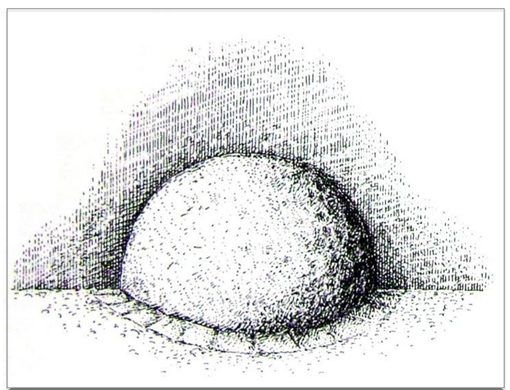

Fig. 2. Reconstruction of the storage (M. Hopf[1])

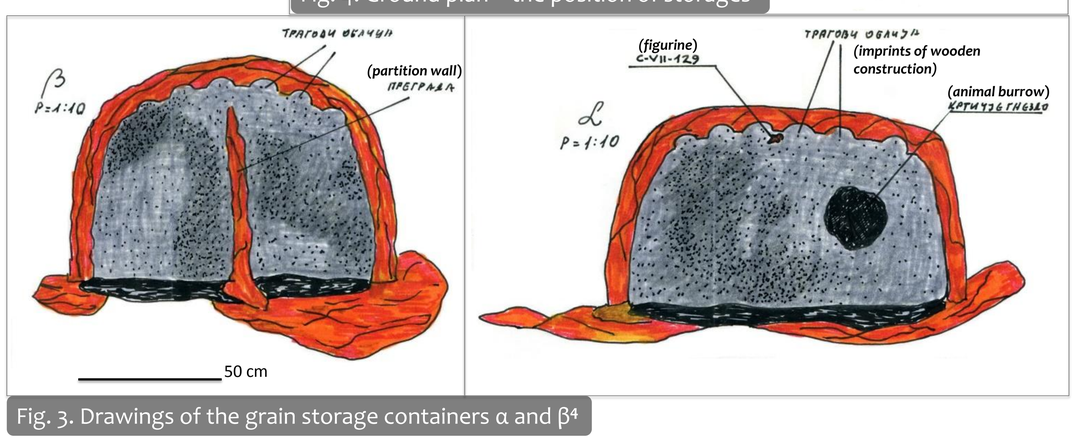

Fig. 3. Drawings of the grain storage containers α and β[4]

Archaeobotanical analysis

The excavation report notes the amount of charred material extracted from 3 of the storages: α (400 cm³), β (1550 cm³) and γ (550 cm³)[4]. The charred material was packed in glass jars with basic provenience data on the labels and a note saying that the samples had been washed in distilled water (Fig. 5). There is no written record of the volume of soil taken from the storages, nor is the flotation procedure described.
The archaeobotanical analysis was carried of subsamples from the each storage (Fig. 6). They had identical composition: einkorn grain (93-99%) and lentil. Wild/weed seeds are almost absent; only two seeds of *Polygonum convolvulus* L. were found (in storage β).

Fig. 5. Stored archaeobotanical samples. Ribbons and wax seals were used to mark the unprocessed samples.

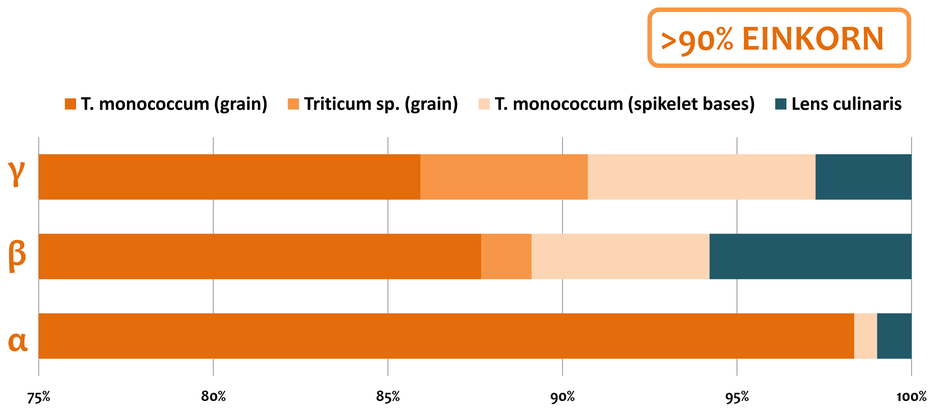

Fig. 6. Quantitative composition of the storage samples

The containers were used primarily for storing of einkorn grain. The largest number of lentil seeds was found in the storage with a partition wall (β) which might have been used for the separation of the different crop types.
Low quantity of chaff would suggest that einkorn was dehusked before storage. Generally poor preservation of chaff in the samples may also indicate unfavorable charring conditions, thus the practice of storing of spikelets cannot be ruled out.
A single grain container could keep c. 300 kg of grain; i.e. the maximum storage capacity would be c. 900 kg.

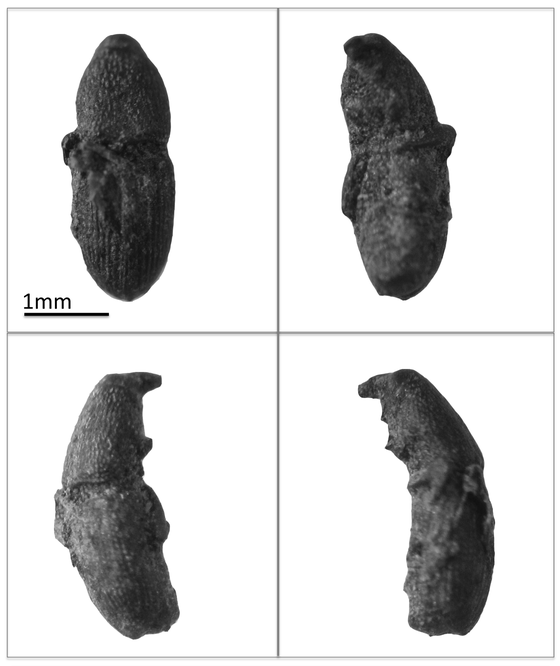

Fig.7. Storage **γ** - Charred remains of **wheat weevil**

In storage γ remains of adult wheat weevil *Sitophilus granarius* L. were found. These are flightless insects that develop inside the grain. One pair can produce several hundred offsprings[5]. Completely closed containers would create anaerobic conditions, and this can be regarded as a protective measure against weevil infestation.

Concluding remarks

Einkorn was one of the principal crops at Selevac[3]. Stores of einkorn shed new light on how it was grown, processed and stored.
The purity of the stored grain suggest that einkorn was grown as a monocrop. The absence of weeds in the storage could imply intensive weeding practices during the growth period or thorough cleaning after the harvest. Either way, this required significant amount of labour investment and/or people. The amount of grain potentially kept in the storages (c. 900 kg) might have been enough for a year supply for a household of six. Whether the production has been organized on a household or communal level is a complex issue which needs further exploration.

It could not be determined with certainty whether einkorn grain was stored cleaned or in spikelets. Given the presence of pests, storing in spikelets would strategically be a better choice.
This find draws attention to the yield losses that farmers face, both through infestation and burning of large quantity of food supplies.

References

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Acknowledgments

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