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ARCHAEOBOTANICAL AND ANTHRACOLOGICAL ANALISYS OF THE ROMAN AND EARLY BYZANTINE CASTLE *ABRITUS* IN NORTH-EASTERN BULGARIA: Some Palaeoethnobotanical and Environmental Aspects

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Introduction

Various complex interdisciplinary approaches have been used in current archaeological investigations that allow more complete knowledge about the palaeoenvironment than has been available hitherto. Archaeobotany provides information about crop plants, development of ancient crop husbandry, and routes of crop migration under human influence. Wild flora and weeds found in the archaeological sites contribute to the understanding of stages in crop husbandry, plant domestication, and agriculture techniques. A large number of wild plants and weeds is a good indicator of conditions in the palaeoenvironment. Anthracology gives information about local vegetation during the different periods of occupation of the archaeological sites. Anthracological methods make possible a better understanding of human influence on vegetation, and also influences in different periods.

There have been a number of archaeobotanical investigations in Bulgaria in connection with prehistory and while records from the Roman age are extremely sparse, they have helped us improve our knowledge about crop husbandry activities during this period, and indirectly about the human impact on vegetation. In this connection such investigations have a particular importance in archaeological and interdisciplinary aspects. The main purpose of this investigation was the archaeobotanical analysis of selected areas in the vicinity of *Abritus*, and in clarifying connections and interactions between ancient agriculture or crop plants, and the spontaneous flora in the area studied.

Materials and methods

Abritus castle is situated in the SE suburbs of Razgrad, on the river Bely Lom. The valley of the river Bely Lom is quite deep in some places, with deep bends: marls and limestone's rocks prevail. Typically, the snow cover of nearby fields is often blown away to another place by northeastern winter winds. This means that crops may be destroyed by frost, which also affects retention of moisture in the soil.

Archaeological characteristics of *Abritus*

According to T. Ivanov (Иванов 1980), the Roman occupation of the site lasted between the 1st and 6th centuries AD. *Abritus* was established in the province *Moesia inferior* as a military camp, and later became a comparatively large settlement. The garrison was of great strategic importance against the barbaric tribes. The well-developed and maintained road system had a positive influence on goods exchange and trade relations. Roman authorities paid particular attention to the rich land of *Moesia* as a source of provisions for the troops. Farming organization was improved; the farms became larger and more efficient, and more successful agriculture techniques were adopted.

Field work and sampling

The archaeobotanical materiel was collected over three archaeological seasons 1991-93. All plant remains (expert those from closed complexes - storage and residue pits, graves, ovens) were extracted from soil samples by means of manual ware flotation and 0,5 mm and 1,0 mm sieves. After extraction, the remains that were sorted and all charred seeds, fruits, grains and wood charcoal were picked out for further identification. The material from most samples was abundant and well preserved. Material was studied from 19 samples taken from 11 contexts and also from squares 7,13,14 and 19.The whole quantity of soil separated by flotation was 600 kg.

Identification of archaeobotanical materials

The material studied derived from 19 samples from different contexts. The most representative came from 4 main sources: square 19, storage 19, storage pits (sector I-6, square19 and 14), coin find (sector I-6, square 13). Each sample consisted of 300-400 g charred material (grains and wood charcoal). The material was identified microscopically, using up to 42 x magnification, and the charred specimens were compared with modern seed reference material, drawings and photos in seed atlases: M. Dobrohotov (Доброхотов 1961), A. Malzev (Мальцев 1973), W. Lampeter (Lampeter 1962), H. Werner, B. Pawlik and F. Schweingruber (Werner et al. 1988).

Drawing apparatus and photographic camera were also applied. The basic morphometrics parameters (L - length, B- breadth, H-height) were measured by eye-lens micrometer (for each species 90 diaspores and when the amount was smaller whatever was possible to measure). Data were processed statistically in two stages. In the first, indices and %-proportions of the morphometric parameters of the seeds and grains were calculated. Next, statistical characteristics - arithmetic mean value, standard deviation, variance, error of the mean arithmetic value, variation factor - were obtained. These were enough to evaluate the data. The data sets of the different samples were analyzed using two statistical techniques:

Correlation analysis. The correlation factors between samples were calculated for each plant species. The result was a correlation matrix, which showed the level of relation between samples by parameters.

Variance analysis. The special features of available data allowed the application of single-factor dispersion analysis. The current value of the parameters of the proportions was compared with the Fisher's factor with the purpose of testing the reliability of the results.

Identification of the wood charcoal

Fragments of carbonized wood were found only 8 of the 23 samples investigated. The identification was accomplished by photonic reflex microscope. For each fragment of wood charcoal, three anatomical sectional views were observed: transversal-longitudinal, tangential-longitudinal and radial. The fragments analyzed were compared with modern reference materiel from the collection of the palaeobotanical laboratory: "Environment and Archaeology", Montpellier. Also, wood sectional view atlases were used. The found wood charcoal belongs to 19 species and genera, and to 3 families.

Results

The 19 archaeobotanical samples consisted of a large number of plant remains that included 10 crop cereals species, 4 leguminous species, 7 fruit species, and 35 weed, ruderals or grassland species.

List of species composition:

1. Cultivated cereals

Triticum dicoccum Schrank
Triticum aestivum L.
Triticum aestivo/compactum L.
Hordeum vulgare var.nudum L.
Panicum miliaceum L. Sorghum bicolor L. (Moench *var.bicolor* de Vet)
Secale cereale L.
Avena sativa L.

2. Cultivated leguminouses

Lens culinaris Medik. var. microsperma
Pisum sativum L.
Vicia ervilia (L.) *Willd.*

3. Fruit and wild trees

Vitis vinifera L.
Vitis sylvestris Gmell.
Persica vulgaris L.
Ficus carica L.
Phoenix dactilifera L.
Pinus pinea L.
Juglans regia L.
Cornus sp.
Pinus sp.
Acer campestre L.
Carpinus sp. L.
Corylus sp. L.
Tilia sp. L.
Sorbus sp. L.
Fagus sp. L.
Clematis sp. L.

Betula sp. L.
Alnus sp. L.
Fraxinus sp. L.
4. Weeds
Adonis cf. flamea Jacq.
Agrostema githago L.
cf. Asperula arvensis L.
Atriplex patuula L.
Brassica cf.nigra L.
Bromus cf.secalinus L.
Bupleurum cf. apiculatum L.
Cardaria draba L.
Centaurea cf. cyanus L.
Chenopodium albym L.
Coronilla varia L.
Fallopia convonvulus L.
Galeopsis ladanum L.
Gallium mollugo L.
G.spirum L.
Lathyrus tuberosus L.
Melampyrum arvense L.
Polygonum persicaria L.
Prunella vulgaris L.
Rumex cf.acetossella L.
Sinapis arvensis L.
Stachys cf.palustris L.
Thymelea passerina (L.), *Coss et Germ.*
Silene sp. L.
Vicia sp. L.

The wide and highly varied spectrum of plants identified - 55 species – provides a good opportunity for archaeobotanical analysis of the site and for clarification of its special features. One of the emphasis of this work was the complex relationship of crop plants and weeds.

Conclusions from the identification of the crop plants

The per-cent proportions were estimated with the purpose of assessing the significance of various crops.

Grains of bread/club wheat were the most abundant among the cereals - 67%, while barley was 27%. Millet and sorghum were presented in smaller quantities, and rye and oats were insignificant. The cereals - mainly the bread/club wheat - prevailed in all samples. In some of samples, the ratio of bread/club wheat and barley was close to 1:1.

Pulses were presented mainly by lens 89%. Broad beans seeds were numerous (fig. 1 and fig. 2). In sample 3 (I-4, square 14) pulses were 20% of the total. Samples 5 and 6, each from a different depth of square 19, contained a relatively high quantity of pulses and equal quantities of barley and wheat. Bread/club wheat prevailed in another two samples – more than 80% of the whole. Sample 4 (I-6, square 13) consisted mainly of wheat - 45% and barley - 43%.

Weeds and ruderals were only 1,2-0,6% of the total number of diaspores. The probable explanation of this low percentage is that the samples were crops in the last stages of processing, probably they were mixtures of cereals and pulses for grinding as preparation for food.

The species *Triticum compactum* Host. and

Panicum miliaceum	3.2
Sorgum bicolor	2
Secale cereale	0.5
Hordeum vulgare	27.3
Triticum aes./comp.	67

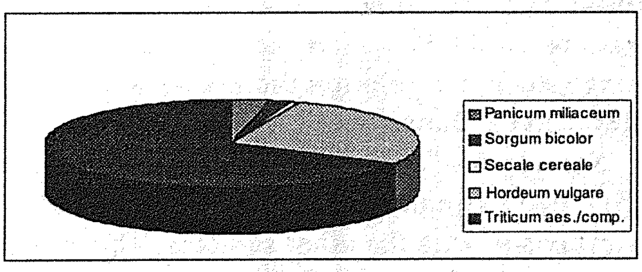

Fig. 1. Percentage proportion of cultivated plants in *Abritus*.

Lens culinaris	89
Vicia faba	5.3
Pisum sativum	4.7
Vicia ervilia	1.0

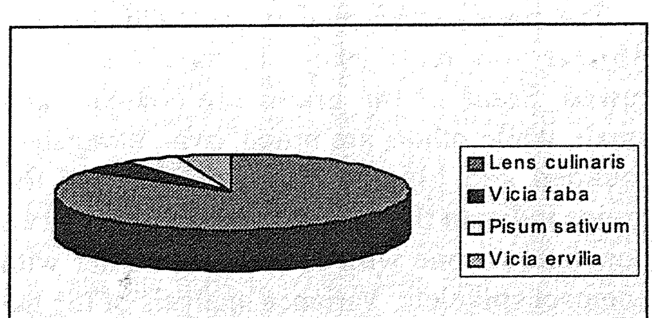

Fig. 2. Percentage proportion of leguminous plants in *Abritus*.

Triticum aestivum L. are similar and it is difficult to distinguish between them. For this reason, some authors regard club wheat as a subspecies of bread wheat. One criterion for the identification of these two species is the length/breath-index (L/B). According to Janushevich (Янушевич 1976, 76-79) those with L/B -1,5-1,8 should be identified as bread wheat. According to prevalence of value 1,5, the grains should be identified as *Triticum aestivo/compactum*. Many of the grains in our material differed in size and shape. For this reason analysis was made according to the L/B-index to determine to which species the charred wheat grains belonged.

It may be assumed that *T.aestivo/compactum* prevailed in our material, and that a tendency to *T.aestivum* could be established. The influence of the "context factor was taken into consideration in computer processing of the experimental data. The analysis of variance of length and L/B-index shows a reliable influence of this factor. For all morphometric parameters and indices the correlation factor was about 0,2. In some cases the correlation reached to 0.075 which indicated a very low congruence. Correlation factors between samples 2 and 3, 2and 5 and 1 and 6 were very low.

Sample 4—"coin find"-context (I-6, square 13)—had extremely low correlation indices in comparison with the other samples. This might be grounds for speculating that the wheat grains probably were not from a single population. The differences between the samples might have been a reason for the presence of species: *T.aesticum* and *T.compactum* mentioned above. It is possible that the specimens from sample 4 had been subject to additional deformations.

The barley cultivated in the fields around *Abritus* was most likely to have been six-rowed. Some of the grains are compact and small, while others are broad, oval, elongated, rounded and bigger. These features of the grains indicate the probable cultivation of two populations: one with loose and another with compact spikelets. Variance analysis of the parameters of barley revealed a reliable influence of the "context"-factor for the L-parameter and unreliable for L/B index. Correlation sets showed a low coincidence among the samples; all correlation factors were under 0,2. The reasons are probably complex such as the cultivation of two different populations, and the variety of conditions in the arable fields. *Abritus* was situated on dry karst ground, but around the site there are moist habitats: for example, one of them today is called "the buggy cornfields".

This is the first time sorghum has been found in such large quantities at an archaeological site in Bulgarian territory. In some samples the sorghum grains weighted about 30-40 g. Sorghum is an interesting find which enlarges our knowledge of the import and exchange of crop plants achieved in Roman times. In this connection the presence of sorghum in the fields of *Abritus* is likely. Climatic conditions were favorable.

Statistical processing revealed the reliable influence of the context"-factor. Correlation factors vary in a wide range: from 0.003 to 0.496.

One of the typical Roman pulses - broad beans - was present in considerable quantities. The conditions of *Abritus* environment were favorable for growing broad beans, because of the possibility of regular irrigation. The seeds found vary remarkably in size: this could be explained by the probable selective use of smaller seeds for food and the larger for sowing. Lentils are of medium size compared with those from the neighbouring Roman town *Nicopolis ad Istrum*. The quantity of this legume suggests that lentils were the most important pulses in *Abritus*. The variance analysis of L and L/B for the "context"-factor proved consistent with this.

Remains of the following fruit plants were also found: wild and cultivated grapes, walnuts, peach, figs, date, Italian stone pine. The finds from grave 7 - stone pine and dates – were obviously imports. The suggestion has been made that these fruits had a ritual significance. The Italian stone pine (*Pinus pinea*) grows in the Western Mediterranean area and its seeds were used by Romans as a food. The date (*Phoenix dactilifera*) was a valuable food and imported from the Near East since the remote past. These finds are evidence of trade relations with the Near East. The finds of grapes, peaches, walnuts etc. are evidence for a well-developed fruit and wine growing industry.

Conclusions from the identification of the weeds

Among the charred plant remains were seeds of weeds, ruderals and some wild plants, which could provide important information about crop husbandry and ecological conditions of the fields during the period in question.

The word "weeds" is used with its popular meaning, which includes anthropophytes with characteristics of weeds as well of ruderals. In some cases they could be archaeophytes, which were used as crop plants in the past, i.e. ksenophytes. The greatest number of the plants termed as weeds in this work could be used for medical purposes, food, or dyeing, although such aspects of human use by men are not the topic of consideration here. As is known, it is difficult to draw a line between ruderals and ksenophytes.

A possible interpretation is the phytosociological one, which regards the plant communities in connection with their environment. If a weed community could be established, it would be possible to draw some conclusions about its environment and crop regimes. Often, however, the charred seed assemblages originate from different fields, so that they do not represent only one plant community, and not all species may be represented in an assemblage - for instance, many may have been eliminated during crop processing (van der Veen 1992, 28). It is quite probable that the charred seeds found in an archaeological "context" are from different communities. Another view is that weed communities were different from these of today because of different degree of soil disturbance (Willerding 1991, 27).

Another approach is the autocological, which concerns the ecology of the individual species. This approach has certain advantages in that species are not regarded as members of a community, which makes possible the use of all species found (not only those connected with a particular community). This provides broader information about the ecological factors (van der Veen 1992, 103).

Among the weed plants, 31 taxons were found and 29 species identified (fig. 3 and 4). The annuals prevailed, which is characteristic of more intensified farming. About ¼ of the species are not typical weeds, but those, which occur on borders of sown fields and sometimes penetrate in the grainfields. In addition, grains of some species were found more characteristic of ruderal habitats or gardens. They could be a component of gardens where pulses were grown. Another possibility is when the field was let fallow, such species grew there and in the following year, some specimens of these species grew together with the crops (Странски 1919, 48).

One way of obtaining these plant remains from charred materials is by means of flotation - soils may also contain charred seeds of plants, which grew around or in the settlement. The plants, which could be characterized to a great extent as typical weeds were the following: *Agrostema gitago, Asperula arvensis, Centaurea cyanus, Melampyrum arvense, Ranunculus arvensis, Bromus secalinus.* These species are predominantly weeds in winter crops. It can be assumed that some of the fields were winter sown, most likely with bread/club wheat (which is winter resistant) and barley. Weed species typical for the spring crops or vegetable gardens were identified: *Brassica nigra, Raphanus raphaistrum,Fallopia conconvulus,* but they could also derive from ruderal habitats. The practice of summer sowing at *Abritus* is quite possible, because strong winds often blow away the snow cover from the fields and consequently winter crops are destroyed by frost. In such a case, barley, which needs a relatively short period for development, would be sown in springtime. The proportion of almost all weed species found was as high (and some of them higher) as crop cereals. This is to be expected, as most weed seeds get into the grain during harvesting. A possible explanation of the presence of middle weight weeds is that many got into the millet, which was sieved through riddles. It would be common for some small weed seeds to remain in the ground millet.

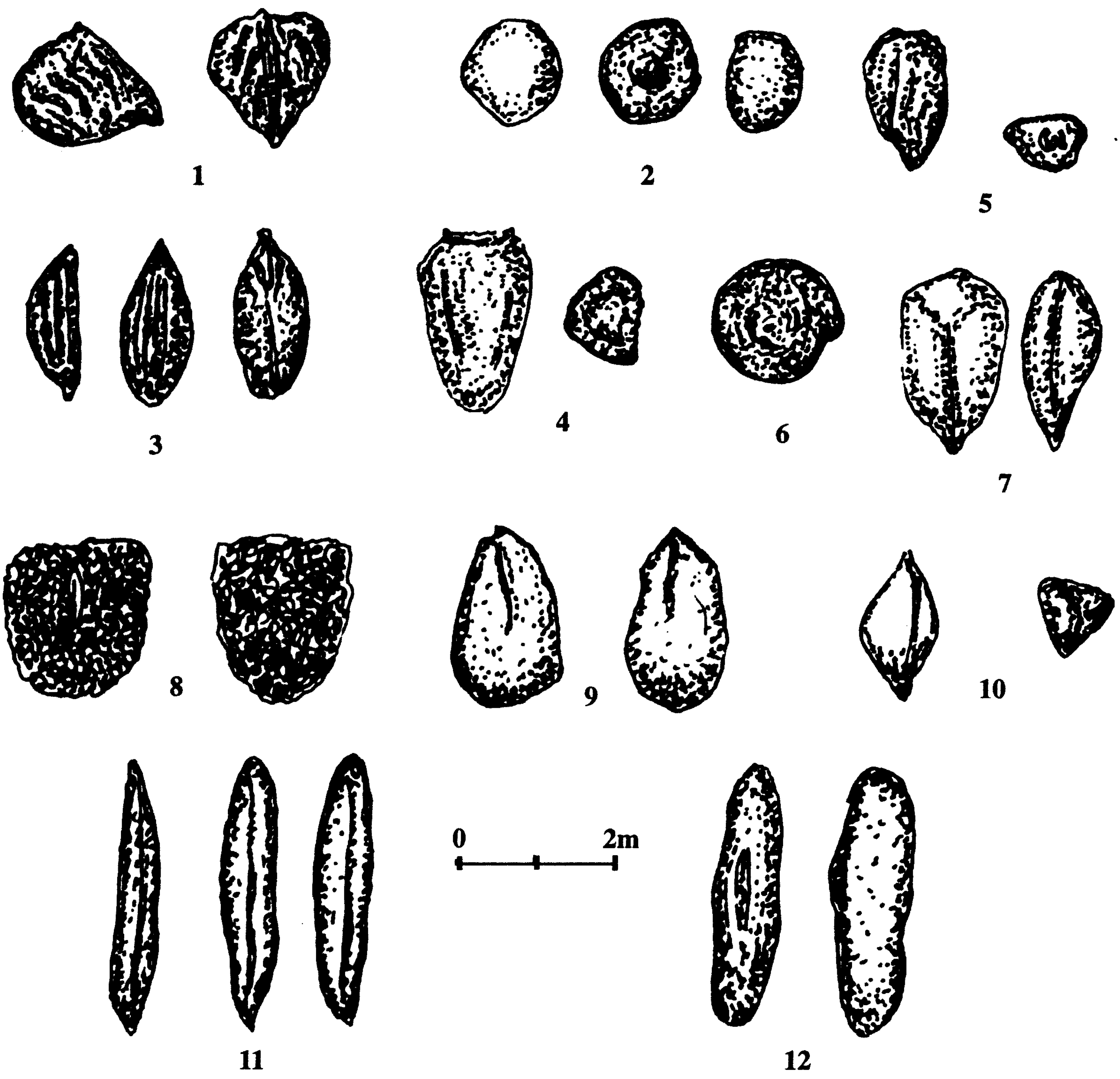

Fig. 3. Wild plants and weeds found in Roman castle *Abritus* (NE Bulgaria): *1. Adonis flamea* L.; *2. Asperula arvensis* L.; *3. Bupleurum apiculatum* L.; *4. Centaurea cyanus* L.; *5. Centaurea cf. diffusa* L.; *6. Chenopodium album* L.; *7. Galeopsis ladanum* L.; *8. Lathirus tuberosa* L.; *9. Cardaria draba* L.; *10. Polygonum persicaria* L.; *11. Bromus secalinus* L.; *12. Coronilla varia* L.

Some of the small seeds may have another origin, for instance: *Sinapis arvensis, Brassica nigra, Chenopodium album* were used for spices, extracting oil or for dyeing. A considerable part of the weeds identified prefers dry soils: *Thymelea passerina, Agrostemma githago, Corolina varia, Galium spirum, Lathyrus tuberosus* or are tolerant to dry conditions: *Bromus secalinus, Rumex acetosella, Chenopodium album*. At the same time two species occupying moist habitats - *Ranunculus arvenis* and *Stachys palustris* - were identified, which was to be expected with the boggy fields around the settlement and the nearby river. *Stahys palustris* is an indicator of heavy clay soils, which need drainage. Most *R.arvensis* plants grow in wet years because the seeds germinate only after a long period of dormancy in

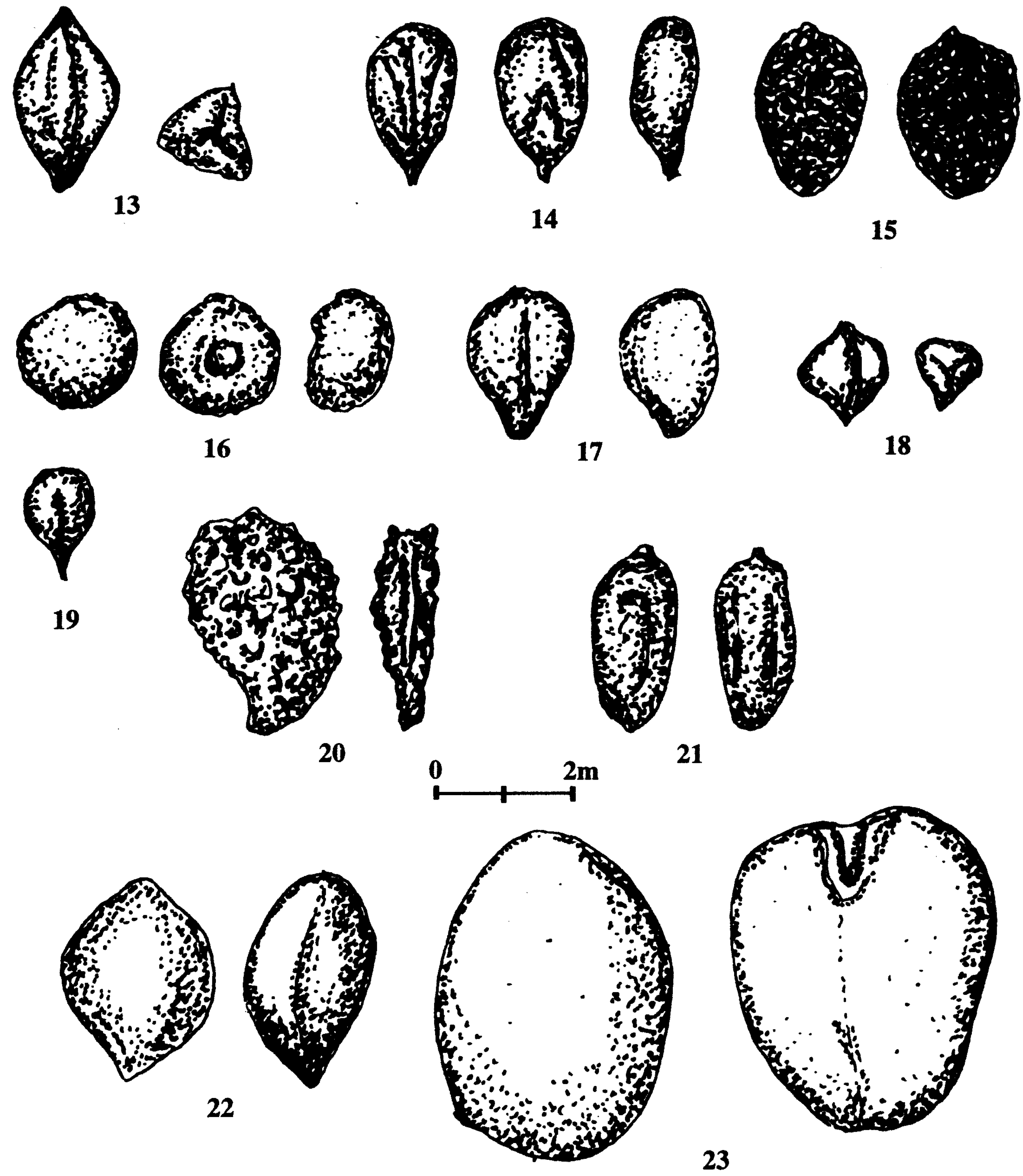

Fig. 4. Wild plants and weeds found in Roman castle *Abritus* (NE Bulgaria): *13. Polygonum convonvulua* L.; *14. Prunella vulgaris* L.; *15. Raphanus raphanistrum* L.; *16. Rubia tinctorum* L.; *17. Stachys palustris* L.; *18. Rumex acetosella* L.; *19. Thymelea passerina* L.; *20. Polygonum arvensis* L.; *21. Melampyrum arvense* L.; *22. Sorghum bicolor* L.; *23. Vicia faba* L.

most conditions. Many species prefer sandy and clay-sandy soils - *Centaurea cyanis, Agrostemma githago, Coronilla varia, Gallium spirum, Bromus secalinus.* Typical nitrophiles are *Chenopodium album, Atriplex patula, Cardaria draba, Polygonum persicaria.* Many species are indicators for calcareous soils - *Adonis flamea, Ranunculus arvensis, Thymelea passerina, Malampyrum arvense, Lepidum campestre, Prunells vulgaris, Bromus* *secalinus*.

So the plants are very reliable indicators of the environmental conditions and could be used to provide formation about crop husbandry and ecological conditions in the past.

Conclusions from the identification of the wood charcoal

Nine hundred and twenty-eight fragments were found in 8 of the 23 samples studied. They are most numerous at the following contexts: sector I-6 (squares 13, 19, 24) 1045 and 1046. It is remarkable that at square 19, in addition to the wood charcoal, a considerable quantity of grains of cereals and pulses was found. Most probably this is connected with the character of the context: the carbonized materiel derives from storage pits. The sample from square 13 (coin find) contains the greatest quantity of wood charcoal. The floristic scale obtained is relatively rich: 19 species and genera, and 3 families. *Quecrus a.f.c* was the dominant species, represented in all of the contexts. *Acer campestre* L., *Cornus* sp.L., *Carpinus sp.*L. and *Corylus sp.* appeared in 5 of the samples, but in different proportions for each sample. The large quantity of *Quercus a.f.c.* in context 1045 could be explained by the degree of fragmentation of the wood charcoal. *Tilia sp., Sorbus sp., Salix sp.L.Fagus sp., Clematis sp., Betula sp.*, occur sporadically in the contexts. The information obtained by the analysis could be interpreted in two perspectives: palaeoethnological and palaeoecological: In this connection the following factors must be taken into consideration:

differences in the contexts;

diversity of fragmentation of the materiel;

size of the fragments.

In terms of the context, the wood charcoal could be derived into two groups: concentrated and dispersed. Concentrated wood charcoal is common for contexts such as pits, ovens, etc., and the dispersed is characteristic of stratigrafic columns. This enabled the interpretation of such finds to be carried out from two perspectives: palaeoecological and palaeoethnological. Plant remains from *Abritus* are derived predominantly from pits and ovens, making the palaeoethnological the more likely approach. The quantity of the materiel is in some cases enough for speculation about the palaeoenvironment. Oak was used most frequently. *Acer campestre, Cornus sp., Carpinus sp., Corylus* sp. were also represented. Also some taxa were found (*Cornus sp., C.sanguinea, Sorbus sp., Rosaceae/Pomoideae*) whose fruits were collected for food. It is likely that they were used for food and fuel.

The species found yield some information about the environmental conditions around the site during the period. Most species of genus *Acer* grow commonly in low places, prefer rich soils and demand light. *Cornus mas* and *Cornus sanguinea L.* prefer more wet conditions and often grow near water. *Corylus sp.* requires good light and adequate moisture. The forest hazelnut could be considered as pioneer species by its role in forming secondary forests. *Alnus sp.* usually appears near water and often together with *Fraxinus sp.* The presence of species that prefer relatively moist habitats, is to be expected with such proximity to the river Bely Lom: their role in the arboreal flora of the area was in the past much as it is today.

The archaebotanical materiel from the Roman castle *Abritis* is important and contributes to the improvement of our knowledge about crop husbandry during this period. Ten crop cereals, four pulses, and some species of fruits were grown. For first time, the cultivation of bread beans and sorghum has been proved in Bulgarian territory for this period—the quantities of many of the samples are large enough to allow such a suggestion.

Certain conclusions from the statistical processing of the material might be suggested:

part of the cereals my have been imported from another region;

conditions of the cultivation fields around the site varied in considerably;

some the samples give evidence of different taphonomy conditions;

crops were produced in different years.

When these interpretations are considered, it is clear that the first is unlikely because *Moesia inferior*, in which *Abritus* is situated, was a well-know area of production and exportation. For the second, some of these differences could be explained by the variety of ecological conditions. The third possibility, particularly for the material "coin-find"-contexts, is likely because of the numerous fragmented seeds. The material may originate from crops of different years, but all the points are equally valid at the current stage of investigation. This speculations might be clarified with more evidence for a wider trade with other Roman provinces. Evidence for this are dates and stone pine from grave 7. Similar finds from closed complexes are found at other antique sites in Bulgaria: Vetren (Попова 1986, 241), *Novae*, *Cabyle* (Popova unpublished).

At this stage of the investigations, it is not possible to determine whether such fruits were part of the common diet of the population of *Abritus*, or were the privilege of the Roman aristocracy.

The archaeobotanical analysis of the large quantity

The fact *Abritus* was a Roman garrison that required a good food supply is a possible explanation.

An archaeobotanical analysis of the settlement (*canabae*) around the garrison would provide interesting material for comparison of food crops. A comparison of our results with these of other Roman sites in North Bulgaria - *Nicopolis ad Istrum* (Buysse 1990; Popova 1999; Popova 1992), *Iatrus* (Hajnalova 1982) - revealed considerable congruence. Wheat and barley were predominant cultivars, while millet, rye and oats were also sown. The pulses used were broad beans, pea and lentils. It is to be noted that bitter vetch was not available at *Abritus*, although it is represented in other analyzed sites. However, there are large quantities of broad beans - a difference from other sites. It is clear that crop husbandry advanced considerably during this period, with a large scale production of cereals, pulses, fruit and wine.

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ПАЛЕОБОТАНИЧЕН И АНТРАКОЛОГИЧЕН АНАЛИЗ НА РИМСКАТА И РАННОВИЗАНТИЙСКА КРЕПОСТ АБРИТУС

Цветана Попова / Елена Маринова

(резюме)

Археоботаничният материал от кастела Абритус (днешен Разград) е изключително разнообразен и ценен за изясняване на стопанството в римска и ранновизантийска Тракия (I-VI век). Според получените резултати в региона били познати 10 житни култури, 4 бобови и много плодни видове.

За първи в района се установи отглеждането на бакла и сорго в големи количества.

Въз основа на плевелните видове допускаме, че нивите са били разнообразни по своите почвени условия - влажност, механичен състав и др. Това би могло да се дължи на различните екологични условия на отглеждане.

Откритите фурми и пиния насочват към търговски контакти със средиземноморските провинции на Рим.

Количеството на археоботаничния материал, намерен в Абритус, е твърде голямо. Вероятното обяснение на този факт е обстоятелството, че като правило римските военни гарнизони били снабдявани добре със зърнени храни.

Отглеждани били преимуществено мека пшеница и ечемик. Засявани били и площи с просо, ръж, овес, а от бобовите растения - бакла, грах и леща.

Разнообразни зеленчукови, лозарски и овощни култури допълвали трапезата на местните жители.

Очевидно земеделието в римска Тракия било много добре развито.

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On the cover: reverse of a Roman bronze medallion; see the paper of I. Youroukova in this issue.

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