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Palaeobiology

Environmental Conditions at the Vani Site of the Classical Period according to Palynological Data

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(Presented by Academy Member David Lordkipanidze)

ABSTRACT. Palynological studies of organic remains in oenochoe and on a bracelet found in burial N24 dated from the second half of the 4th century BC at the Vani-site showed that they represented fossilized honey. As a rule, palynological spectrum of modern honey contains a lot of pollen of melliferous plants, since it is good at preservation. Pollen grains of 24 woody and 34 non-woody plants were identified in samples from Vani, the majority of which belong to melliferous plants. Discovery of bee hairs and claws in the samples served as an additional proof in favour of honey's existence. Diverse composition of the palynological spectra gave an opportunity for definition of environmental conditions, habitual for the Vani population in the second half of the 4th century BC. It appeared that some hills in this area were covered with chestnut and lime forests. Existence of such forests assisted to mighty development of apiculture. Oak, elm, maple, zelkova tree and hornbeam grew in the forests, too. Compared to the present-day situation, climate was warmer. Supposedly, growth of zelkova trees, chestnut, lime, adders-tongue fern was due to the warm climate. *© 2017 Bull. Georg. Natl. Acad. Sci.*

Key words: palynology, Classical Period, palaeolandscape

Palynological researches of archaeological materials, particularly of organic remains obtained from burials, have a rather short history in Georgia. Results of pioneer studies carried out in Georgia, pertaining to Tqemlara mounds, were published in 2004, while similar researches in the Europe and America were carried out already in the second half of the 20th century [1, 2]

It appeared that the palynological material obtained from the vessel content found in graves was richer. These data assisted in a detailed restoration both of past landscapes and climatic conditions [3-7]. As for the burials of Classical Period in Western Georgia, their large-scale palynological researches were commenced only in 2012-2013 [6, 7].

The presented article deals with the results of the palynological studies of the oenochoe contents (Fig. 1), and a textile attached to the bracelet (Fig. 2) of one of the deceased, as well as of other organic remains, found in burial N24 of Vani. It is worthy to note that the textile was three-layered. The palynological spectrum of the samples was rather remarkable. Pollen grains of 58 plants were defined in this case.

Fig. 1. Vani Site. View of grave №24.

Material and Methods

Collected material was processed in the Laboratory of Palynology of the Georgian National Museum by the standard method [8]. At the first stage, the sample was boiled in 10% potassium alkaline, then the material was centrifuged in cadmium solution in order to excrete all kinds of organic remains being in it and isolate them from mineral composition. Acetolysis, i.e. coloration of received microfossils took place at the final stage [8].

We performed identification, counting, and photographing of the material by means of light microscope Olympus BX43. At the last stage, statistic processing of registered pollen grains and other types of palynomorphs and graphical representation of the results were carried out with the use of palynological program Tilia [9]. Modern, standard preparations, as well as new atlases were used for identification of non-palynological remnants and pollen grains of plants.

Results and Discussion

The pollen spectra of the oenochoe's contents. Two samples were collected from the vessel under discussion: the first one – from the surface of the oenochoe, the second one – from the bottom of the vessel in the form of scrapings. Palynological spectra of the arboreal pollen are presented on the diagram (Fig. 3).

Great quantity of pollen grains was found in both samples. More than 500 pollen grains were counted on a half part of each slide. Pollen grains of chestnut (*Castanea sativa*) and lime (*Tilia*) prevailed among arboreal plants (Fig. 3). Pollen grains of maple (*Acer*), azalea (*Rhododendron luteum*), grapevine (*Vitis vinifera*), and hazel (*Corylus avellana*) were identified in considerable amounts. Separate pollen grains of oak (*Quercus*), alder (*Alnus*), walnut (*Juglans regia*), pine (*Pinus*), elm (*Ulmus*), willow (*Salix),* buck-

Fig. 2. Vani site. Grave №24, A - oenochoe; B - bracelet.

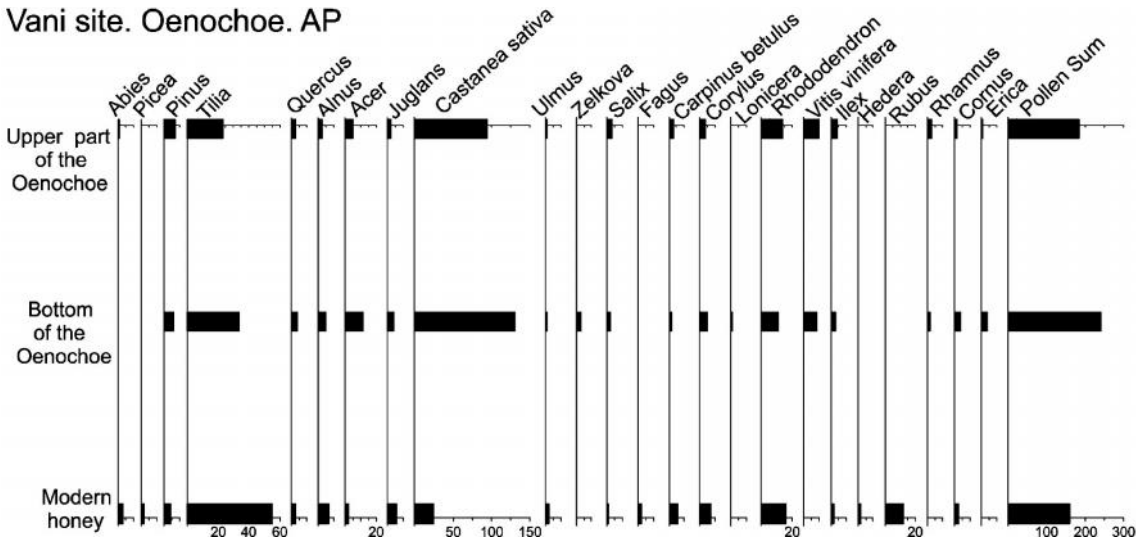

Fig. 3. Arboreal pollen diagram of organic remains from the oenochoe.

thorn (*Rhamnus*), dogwood (*Cornus*), holly (*Ilex),* and groats (*Erica).* Separate pollen grains of fir-tree (*Abies nordmanniana*), honeysuckle (*Lonicera*), and zelkova tree (*Zelkova carpinifolia*) were found as well. Pollen grains of plantain (*Plantago lanceoleta, P. media, P. major*) dominated among herbaceous plants. Pollen grains belonging to Rosaceae, Apiaceae, Labiatae, Lamiaceae, knot-grass (*Polygonum*), and aster (*Aster)* were found in small amounts. Pollen grains of cranesbill (*Geranium*), wheat (*Triticum*) and other sowing cereals (Cerealia), clover (*Trifolium*), sorrel (*Rumex*), celery (*Apium*), yarrow (*Achillea*), and belonging to others were found as well. Majority of the above mentioned pollen grains belongs to the melliferous ones (Fig.4).

Among non-palynological residues, parenchymal cells of wood were prevailing. Discovery of hairs, claws and epidermis of bees in the sample of the oenochoe, as well as of honey-bearing plants, proved existence of honey in this vessel.

The pollen spectra of textile found on the bracelets. Mass of the samples collected from the bracelet was insignificant, correspondingly quantity of palynomorphs and their taxonomic contents in them was not as rich as in the oenochoe. Their arboreal pollen spectra are represented on Fig. 4. Similarly to the case in the oenochoe, the palynological spectrum was mainly represented by melliferous plants. Pollen grains of the herbaceous plants were represented in great numbers in the bracelets' textile. Among them were counted: clover (*Trifolium*), celery (*Apium*) and other Apiaceae. There were found pollen grains of honey-bearing-herbaceous plants, such as: *Lathyrus*, Fabaceae, Lamiaceae, Boraginaceae, *Xanthium, Colchicum, Fagopyrum, Geranium, Sedum, Achillea, Cannabis.*

Pollen grains of lime (*Tilia*) were found in all the three layers of the arboreal plants (Fig.4). The lower layer contained pollen grains of chestnut (*Castanea sativa*). Pollen grains of pine (*Pinus*), alder (*Alnus*), oak (*Quercus),* maple (*Acer*), willow (*Salix*), honeysuckle (*Lonicera*), and azalea (*Rhododendron luteum*) were encountered in the samples. Similarly to the contents of the oenochoe, preservation of the pollen grains in the samples under discussion is very good.

Fibers of flax prevail in non-pollen palynomorphs (NPP), among them fibers dyed in blue and red colors were also encountered. Textile fibers of cotton and silk were found in small quantities. Fiber of an unidentified textile was discovered, too. A lot of wood tracheal cells were found in the samples of the bracelet. They could be remains of coffin or a sarcophagus. Of non-pollen palynomorphs, herbaceous

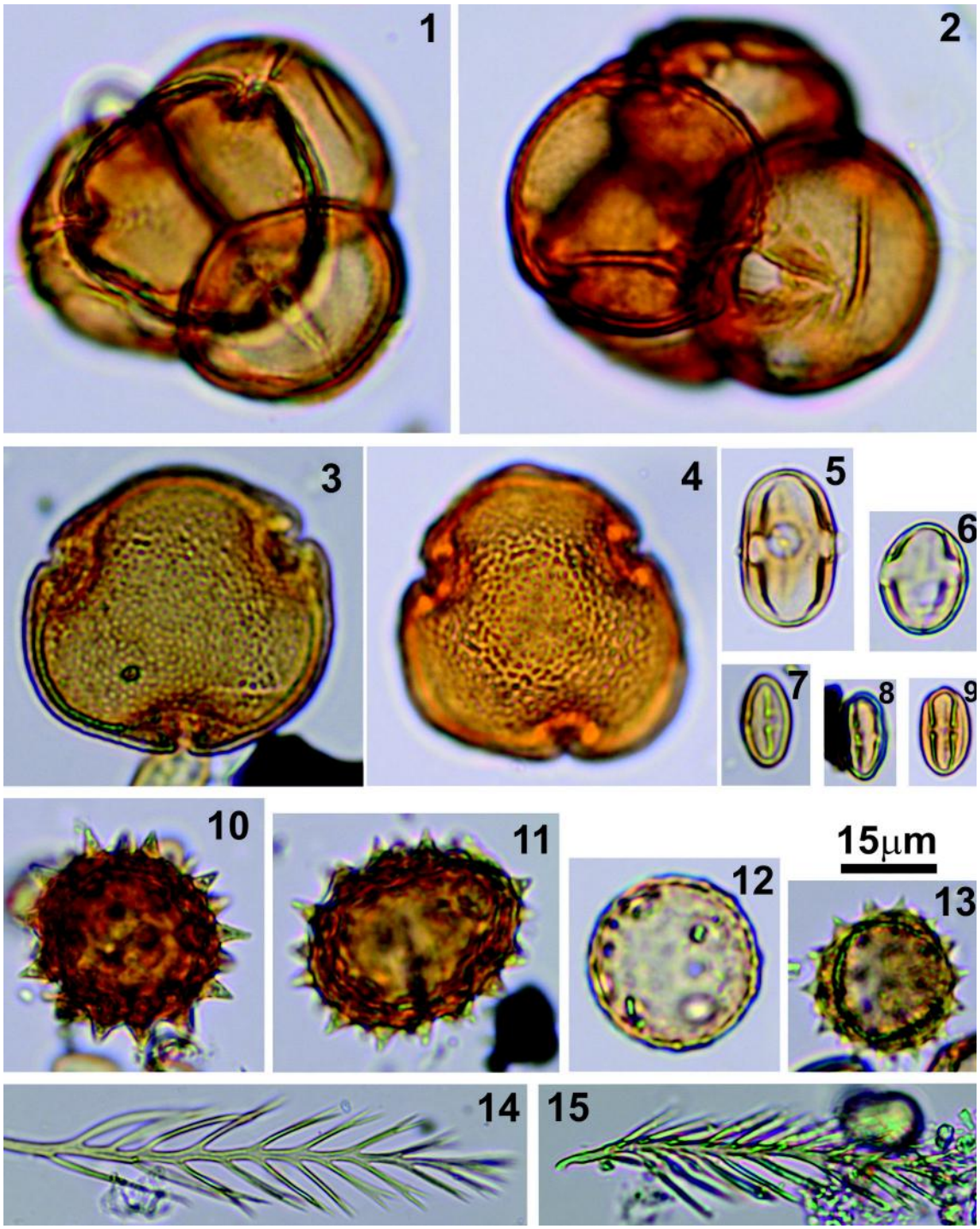

Fig. 4. Vani. Melliferous plant pollen grains found in the samples of the oenochoe and the bracelet. **Oenochoe:** 1-azalea (*Rhododendron luteum*); 3-lime (*Tlila*); 7,8-chestnut (*Castanea sativa*); 10,11- thistle (*Carduus)*; 12-plantain (*Plantago lanceolata)*; 13-yarrow (*Achillea)*; 15-bee hair. **Bracelet**: 2-*Rhododendron luteum*; 4-*Tilia;* 5,6- Apiaceae; 9-*Castanea sativa*; 14-bee hairs.

phytoliths and starch were represented. Discovery of fungus chaetomium (*Chaetomium*) in the same sample was notable. This fungus grows on a textile of flax and disintegrates it [10]. Zoological materials of the collected samples are represented by bee hairs and its epidermis.

Palynological spectrum of modern honey from chestnut forest area (Mukhura village) was also studied. It revealed the same composition as the spectra of the fossilized materials. Arboreal plants are distinguished for a great quantity of pollen of chestnut and lime. A lot of pollen grains of azalea were identified in the group of shrubbery. Pollen grains of blackberry (*Rubus)* were numerous as well. Blackbarry and azalea belong to honey-bearing plants. Both plants represent good indicators of felling of wood, since they are spread exactly in such areas. It should be noted as well, that compared to the fossilized honey, the present-day honey contains much more bee hairs.

The composition of the palynological spectra of the discussed material gives opportunity for identification of the kind of environmental conditions surrounding the Vani site area in the second half of the 4th century. Supposedly, the part of the Vani hills was covered with chestnut and lime forests. Existence of such forests greatly assisted to development of apiculture.

Oak, elm, maple, zelkova tree and hornbeam were growing in the Vani forests. Since the climatic conditions were warmer compared to the present-day situation, no beech forests were largely expanding there. As for the zelkova tree, chestnut, lime, and adders-tongue fern, their growth was determined by the warm climate itself.

Bushes of *Rhododendron, Lonicera, Corylus, Ilex, Rhamnus, Cornus,* and *Erica* were widely spread in the aforementioned deciduous forests. *Alnus* and *Salix* grew in flood meadows. Plenty of warm-loving ferns, such as *Ophioglossum vulgatum,* grew in the forests under discussion. There were many representatives of *Pteridium aquilinum* and Polypodiaceae, as well as of other genera. Pine forests spread in high mountains nearby Vani, as well as a small amount of fir-trees and spruces.

As for cultural landscapes, they were represented by areas under crops of cereals and flax. It is remarkable that macroscopic remains of wheat and other sowing cereals, as well as flax were discovered at the Vani Site, in the habitation layers of the same period [11]. Supposedly, horticulture and viticulture were of significant importance. Pollen grains of chestnut, hazel nuts, and cultivated vine proved this assumption. Similar data were received thanks to palynological researches of material obtained from burial N22 at the Vani Site. All four amphorae found in the grave contained wine [12].

Presumably Vani was densely populated in the second half of the 4th century BC. It is proved by a great amount of pollen grains of weeds in the palynological spectra. Weeds grew in the yards of human residences, along roads and among garbage.

Conclusions

The palynological research under discussion showed that compared to the present-day situation, climate in the second half of the 4th century BC in Colchis, particularly in the environs of Vani, was warmer.

Palynological spectrum of the fossilized honey showed that chestnut woods grew in the vicinity of ancient Vani. Trees of lime, maple, oak, zelkova, elm, alder, hornbeam and other deciduous plants grew there. Azalea (*Rhododendron luteum*), honeysuckle (*Lonicera*), buckthorn (*Rhamnus*), dogwood (*Cornus*), holly (*Ilex*), and heather grew in shrubbery.

Relying on the palynological data, it could be concluded that cereals, viticulture and horticulture were well-developed in Vani and its environs in the period under discussion. This supposition was proved by the palaeobotanical researches carried out at the Vani site.

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პალეობიოლოგია

ანტიკური ხანის ვანის ნაქალაქარზე არსებული გარემო პირობების აღდგენა პალინოლოგიური მონაცემების მიხედვით

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** საქართველოს ეროვნული მუზეუმის ანთროპოლოგიის და პალეობიოლოგიის კვლევითი ინსტიტუტი, თბილისი, საქართველო*

(წარმოდგენილია აკადემიის წევრის დ. ლორთქიფანიძის მიერ)

ვანის ნაქალაქარის № 24 სამარხში (ძვ. წ. მე-4 საუკუნის მეორე ნახევარი) აღმოჩენილ ბრინჯაოს ოინოხოასა და სამაჯურზე შერჩენილი ორგანული ნაშთების პალინოლოგიურმა კვლევამ აჩვენა, რომ ეს ნაშთები განამარხებულ თაფლს წარმოადგენს. როგორც წესი, თანამედროვე თაფლის პალინოლოგიური სპექტრი თაფლოვანი მცენარეების მტვრის დიდ რაოდენობას შეიცავს, რადგან ის კარგი კონსერვანტია. ვანის ნიმუშებში აღმოჩნდა 24 ხემცენარისა და 34 ბალახოვნის მტვრის მარცვლები, რომელთა უმეტესობა თაფლოვან მცენარეებს განეკუთვნება. ნიმუშებში ასევე გამოვლინდა ფუტკრის ბუსუსები და კლანჭები, რაც განამარხებული თაფლის არსებობის კიდევ ერთი მყარი არგუმენტია.

პალინოლოგიური სპექტრების მდიდარმა შემადგენლობამ საშუალება მოგვცა დაგვედგინა გარემო პირობები, რომელშიც ვანის მოსახლეობა ძვ.წ. მე-4 საუკუნის მეორე ნახევარში ცხოვრობდა. ჩატარებული კვლევის თანახმად, იმდროინდელი ვანის ბორცვების ნაწილი წაბლისა და ცაცხვის ტყით იყო დაფარული, რაც ხელს უწყობდა მეფუტკრეობის განვითარებას. ვანის ტყეებში მუხა, თელა, ნეკერჩხალი, ძელქვა, რცხილაც იზრდებოდა. პალინოლოგიური მონაცემების მიხედვით, ვანსა და მის შემოგარენში კლიმატური პირობები დღევანდელთან შედარებით უფრო თბილი იყო.

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