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Eliso Kvavadze[1], Maia Chichinadze[2], Amiran Kakhidze[3], Nargiz Surmanidze[4], Malxaz Nagervadze[5]

PALYNOLOGY AS AN IMPORTANT TOOL FOR THE RECONSTRUCTION OF DIET, DISEASES AND FOLK MEDICINE OF THE POPULATION OF THE CLASSICAL PERIOD SETTLEMENT NAMCHEDURI II (WESTERN GEORGIA)

ABSTRACT

Kvavadze E., Chichinadze M., Kakhidze A., Surmanidze N. and Nagervadze M. 2022. Palynology as an Important Tool for the Reconstruction of Diet, diseases and Folk Medicine of the Population of the Classical Period Settlement Namcheduri II (Western Georgia). *Sprawozdania Archeologiczne* 74/2, 29-51.

Layers of the Namcheduri II settlement (Western Georgia) dated from the 5th-4th centuries BC have been studied by the palynological method. It revealed that cereals represented the main component of the population's diet in the discussed period. The nutritive ratio included chestnut, hazel, walnut, and grapes. The majority of the plants apparently used for medical purposes represent medicinal remedies against rheumatism, arthritis, and diarrhea. Presumably, malaria, diabetes, and epilepsy occurred rarely since the medicinal remedies used against them were poorly evidenced.

Plenty of eggs of parasitic worms discovered in the group of non-pollen palynomorphs in some samples and their taxonomic variety indicates at wide spreading of helminthosis in the population in the period under discussion. Eggs of *Trichuris trichuira*, *Ascaris lumbricoides*, *Capillaria*, *Enterobius vermicularis*, Yokogava fluke were present. The abundance and diversity of eggs of parasitic worms in the obtained material gives grounds for supposition that this part of the settlement was used as a latrine.

Keywords: Palynology, Classical Period human feces, Palaeodiet, Paleopharmacology, Georgia
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1 Paleoanthropology and Palaeobiology Research Institute of Georgian National Museum, 3 Shota Rustaveli Ave, Tbilisi 0105 Georgia; e.kvavadze001@gmail.com; ORCID: 0000-0002-6059-0861
2 Paleoanthropology and Palaeobiology Research Institute of Georgian National Museum, 3 Shota Rustaveli Ave, Tbilisi 0105 Georgia; maizdr001@gmail.com; ORCID: 0000-0003-3209-3654

INTRODUCTION

Palynological investigation of the archaeological material proved that human fossilized excrement, *i.e.* coprolites, contained well-preserved pollen grains and plenty of non-pollen palynomorphs (Matsui *et al.* 2003; Oeggl 2008; Brinkkemper and Haaster 2012; Kvavadze 2016; Deforce 2017; Kvavadze *et al.* 2020). It is notable that at present material of this type is predominantly examined in the form of organic residues evidenced in the abdominal area or by the sacrum of the deceased.

As for the fossilized faeces material, it is more carefully investigated by means of the paleobotanical method, since the material in question contains lots of plant seeds and macroscopic remains of insects (Matsui *et al.* 2003).

The rich composition of the palynological spectrum of fossil faeces is helpful not only in reconstruction of the detailed paleoecological environment (in the case of herbivores), but, in addition, relying upon its data, it becomes possible to reconstruct a precise human diet. Besides this, medicinal plants used by ancient humans can be identified. On the grounds of pollen grains of the medicinal plants discovered in the excrement, it is available to define types of cured deceases, since humans in many cases both in the past and the present have been using one and the same medicinal plants.

The best examples of such assumption are well-known yarrow (*Achillea*) and cornflower (*Centaurea*) – good remedies for treatment of gastrointestinal and gallbladder problems in folk medicine (Al-Snafi 2015a; Fortini *et al.* 2016) – already familiar to the Palaeolithic humans. In the Upper Palaeolithic, the humans dwelling in the caves of Dzudzuana, Satsurblia, and Kotias Klde collected and kept there the aforementioned plants (Martkoplishvili and Kvavadze 2015). Pollen grains of yarrow and cornflower were found in the Middle Palaeolithic cave Shanidar IV, in Iraq (Leroi-Gourhan 1975; Lietava 1992), implying that the humans of that period suffered from problems of abdominal cavity organs. Pollen grains of plants, medicinal properties of which are recognized at present, have been found in the course of research at other archaeological sites as well (Merlin 2003; Chaves and Reinhard 2003; Kvavadze *et al.* 2010a; 2013; 2016).

It is remarkable that large amounts of pollen of edible plants, medicinal herbs and eggs of parasitic worms are frequently simultaneously evidenced in palynological spectra of organic residues collected from the abdominal areas of humans (Kvavadze 2016; Kvavadze *et al.* 2013; 2015; 2020).

3 LEPL Adjara Museum. Archaeological Museum, 77, Chavchavadze St, Batumi, 6010 Georgia; amirankakxidze35@gmail.com; ORCID: 0000-0003-2319-0436
4 LEPL Adjara Museum. Archaeological Museum, 77, Chavchavadze St, Batumi, 6010 Georgia; Surmanidze.nargiz@mail.ru; ORCID: 0000-0002-5452-7612
5 LEPL Adjara Museum. Archaeological Museum, 77, Chavchavadze St, Batumi, 6010, Georgia; Malxaz.nagervadze@mail.ru; ORCID: 0000-0002-8057-7373

Fig. 1. Map of Georgia and the location of the Namcheduri II settlement

No palynological – and generally no palaeobotanical – research has ever been carried out to study ancient faeces from cesspit or latrine materials in the region of Transcaucasia. Both single human faeces and ancient latrines are more frequently studied in other regions by paleoparasitologists whose main goal is to reveal helminthosis (Araújo *et al*. 1981; Han *et al*. 2003; Le Bailly and Bouchet 2006; Ledger *et al*. 2020).

This discussion concerns the organic remains collected from the settlement of Namcheduri II located in the south-western part of Georgia (the territory of Adjara) in the course of the archaeological excavations carried out in the summer of 2019 (Fig. 1). The site in question is incorporated into the Pichvnari complex. The habitation layers studied palynologically were dated to the 5th-4th centuries BC on the basis of the archaeological artefacts. The archaeological investigation both of Namcheduri II and the Pichvnari site have a long history (Mikeladze and Khakhutaishvili, 1985; Vickers and Kakhidze 1999; 2006; Kakhidze 2001; 2020).

MATERIAL AND METHOD

Five samples obtained from Namcheduri II dated to the period in question were studied palynologically (Figs. 2, Table No 1). Of them, two samples (No 2 and 3) were collected near the remains of wooden beams in square N 31 (sector CD-1/76) of the site. It is notable that the beams bore traces of processing as their tips were sharp. From the archaeological point of view, they probably represent a wattle and daub type of wooden construction. The palynological spectra of the aforementioned two samples (Nos 2, 3) cardinally differed from those collected from the plaster and floor of the same square.

The fossilized spectra were compared with those of the present-day soil (sample No 1) in order to avoid cases of contamination of the material. The palynological spectra of all mentioned samples are presented in the diagrams (Figs. 2 and Table No 1). The material was processed in the Palynological Laboratory of the Georgian National Museum by means of the standard method (Erdtman 1969; Moore *et al*. 1991). At the initial stage, the material was boiled in a 10% solution of potassium hydroxide (KOH) for 10-15 min. To get rid of the solution of potassium hydroxide, the material was washed for 24 hours. In the second stage, the material was centrifuged in a heavy liquid for separation of the organic and the mineral materials. In the third stage, the material was washed to get rid of the heavy liquid and the acetolysis was performed resulting in repeated cleaning of the microscopic remains and acquisition of their darker colour.

Identification of the palynomorphs, their counting, and photographic documentation were performed using a Olympus BX 43 light microscope. The obtained results were statistically processed by means of the program 'TILIA' (Grimm 2016).

RESULTS OF THE STUDY

The samples No 2 and **3** collected in one and the same layer revealed nearly similar palynological spectra. Of arboreal plants, pollen grains of alder (*Alnus*) and chestnut (*Castanea sativa*) dominated in both samples. Coniferous plants were rather well presented, among which pollen grains of pine (*Pinus*) prevailed. Less prominent was spruce (*Picea orientalis*), while fir-tree (*Abies nordmanniana*) was represented by single pollen grains (Fig. 2).

Small amounts of deciduous plants were defined. Among them were: beech (*Fagus orientalis*), oak (*Quercus*), hornbeam (*Carpinus betulus*), lime (*Tilia*), elm (*Ulmus*), zelkova tree (*Zelkova fraxinifolia*), walnut (*Juglans regia*), and ash (*Fraxinus*). Single pollen grains of birch (*Betula*), grapevine (*Vitis vinifera*), guelder-rose (*Viburnum*), willow (*Salix*), blackberry (*Rubus*) were also found (Fig. 2). Of herbaceous plants, pollen grains of wheat and other cereals for sowing prevailed and they dominated in the spectrum. Goosefoot (*Chenopodium album*, Chenopodiaceae), chicory (Cichorioideae), cornflower (*Centaurea*), nettles

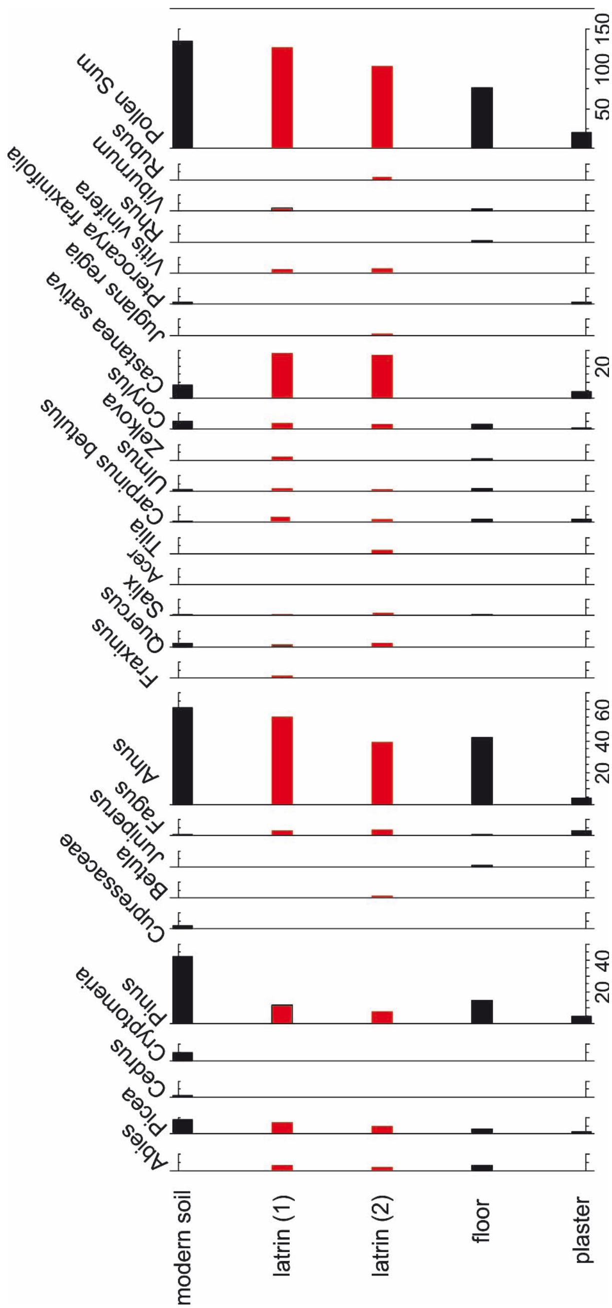

Fig. 2. Arboreal pollen diagram of the organic remains of the Namcheduri II settlement (medicinal plants pollen dyed red)

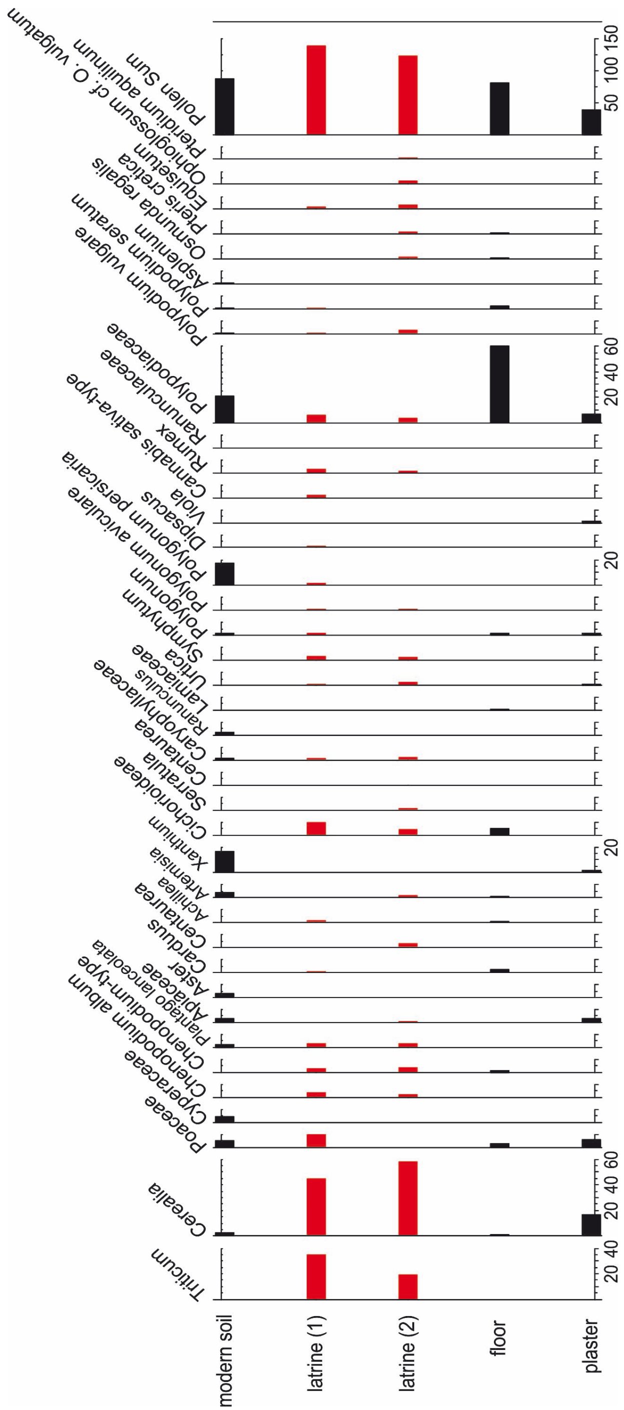

Fig. 3. Non arboreal pollen diagram of the organic remains of the Namcheduri II settlement (medicinal plants pollen dyed red)

(*Urtica*), wild sorrel (*Rumex*), knot-grass (*Polygonum*, *Polygonum aviculare*, *Polygonum persicaria*) were well represented. Pollen grains of yarrow (*Achillea*), thistle (*Carduus*), hemp (*Cannabis*), great plantain (*Plantago*), teasel (*Dipsacus*), comfrey (*Symphytum*), wild grasses (Poaceae), legumes (Lamiaceae), cloves (Caryophyllaceae), wormwood (*Artemisia*), saw-wort (*Serratula*), umbellifers (Apiaceae), Cyperaceae, Fabaceae, and aster (*Aster*) were also found (Fig. 3).

Spores of forest ferns were identified in the palynological spectra of the two samples under discussion. Among them were: adder's fern (*Polypodium vulgare*), black spleenwort (*Polypodium serratum*), adder's tongue fern (*Ophioglossu vulgatum*), pteris (*Pteris cretica*), woolly bracken (*Pteridium aquilinum*), royal fern (*Osmunda regalis*), and horsetail (*Equisetum*) (Fig. 5).

The spectra of both groups of the non-pollen palynomorphs (NPP) resembled each other. Disintegrated tracheal cells of wood prevailed. At this stage of research parenchymal cells of pine (*Pinus*) and elm (*Ulmus*) were defined (Fig. 2). Lots of eggs of the parasitic worms, namely, trichura (*Trichuris trichiura*) and ascaris (*Ascaris lumbricoides*) were identified in the spectra (Figs. 3 and 6). There were also eggs of other parasitic worms. Among them were: *Capillaria*, *Enterobius*, *Yokogawa*. Eggs of unspecified worms were evidenced, too (Table 1 and Fig. 6). Great amount of insect hairs, their epidermis, and other microscopic residues were also found (Table 1).

It is remarkable that bee hairs were evidenced in both samples. An animal hair was found in sample No 3. Fungal spores were revealed in small amounts. Among them were: *Brachysporium*, *Chaetoium*, *Cercophora*, *Gelasinospora*, *Podospora*, and *Sordaria*. Starch grains, remains of moss and other plants were defined. Fibres of linen fabric were found in both the samples. A fibre of cotton fabric was evidenced only in the sample No 2. A testate amoeba *Arcella* that lives in wet moss was found in the sample No 3. Remains of the freshwater aquatic plant *Pseudoschizaea* was identified in both the spectra, while an aquatic plant *Dinoflagellata* – only in the first one (No. 2).

The sample collected from the building floor (*Sample No. 4*). As has already been noted, all in all 20 taxa were defined in the sample under discussion. This figure was twice less than those in samples No 2 and No 3, where pollen grains of 45 taxa were identified. Pollen grains of 10 arboreal plants were discovered in the organic remains collected from the floor. Alder (*Alnus*) prevailed. No pollen grains of chestnut (*Castanea sativa*), dominating in the palynological spectra of the previous samples No 2 and No 3, were evidenced.

Pollen grains of fir-tree (*Abies nordmanniana*), spruce (*Picea orientalis*), and pine (*Pinus*) were numerous. Pollen grains of juniper (*Juniperus*), beech (*Fagus orientalis*), willow (*Salix*), hornbeam (*Carpinus betulus*), elm (*Ulmus*), and hazel (*Corylus*) were in small amounts.

Among herbaceous plants were: goosefoot (*Chenopodium album*), knot-grass (*Polygonum*), wormwood (*Artemisia*), and thistle (*Carduus*). It was especially remarkable that plenty of pollen grains of forest ferns (Polypodiaceae), playing a dominant role there, were evidenced in the spectrum in question.

Table 1. Quantitative composition of Non-Pollen- Palynomrphs from the organic remains of the Namcheduri II settlement

Namcheduri	1	2	3	4	5
Non Pollen Palynmorphs	modern soil	latrine 1	latrine 2	floor	plaster
Undiff. ascospores	19	9	10	72	9
Sporormiella				4	
Chaetomium	1	2	3		
Sordaria		6			
Gelasinospora		5	3		
Brachysporium	15	2	1	4	
Cercophora		7	9		
Podospora		2			
Glomus	12				
Tracheal cells of undiff. wood	62	85	98	87	89
Tracheal cells of *Pinus*		2	6		2
Tracheal cells of *Ulmus*		4	3		3
Wood vessel			2	5	
Starch grains	98	13	12	61	27
Starch of cerealia	38				15
Fibre of flax	4	3	4	10	23
Fibre of wool					1
Fiber of cotton		2		3	7
Fiber of cannabis					3
Seeds	3				
Phytoliths				2	2
Plant epidermis		11			
Zoomaterial	14	10	20	4	
Zooepidermis	28	15	15	6	6
Hear of bee		2	2		
Hair of insecta	5	6	8		1
Claw of insecta	3				
Chela of acari					1
Hair of acari	2				
Cuticle of butterfly wing		1			
Hair of animal			2		
Pseudoschizaea	1	3	4	2	
Dinoflagellata		2			
Spirogyra	1				
Arcella			2		
Moss remains	3	9	7		
Eggs of *Trichuira*		23	17		
Eggs of *Ascaris lumbricoides*		7	6		
Eggs of *Capillaria*		2			
Eggs of *Enterobius vermicularis*		2			
Eggs of *Yokogawa fluke*			2		
Undiff. eggs			2		
Total NPP Sum	309	235	238	260	189

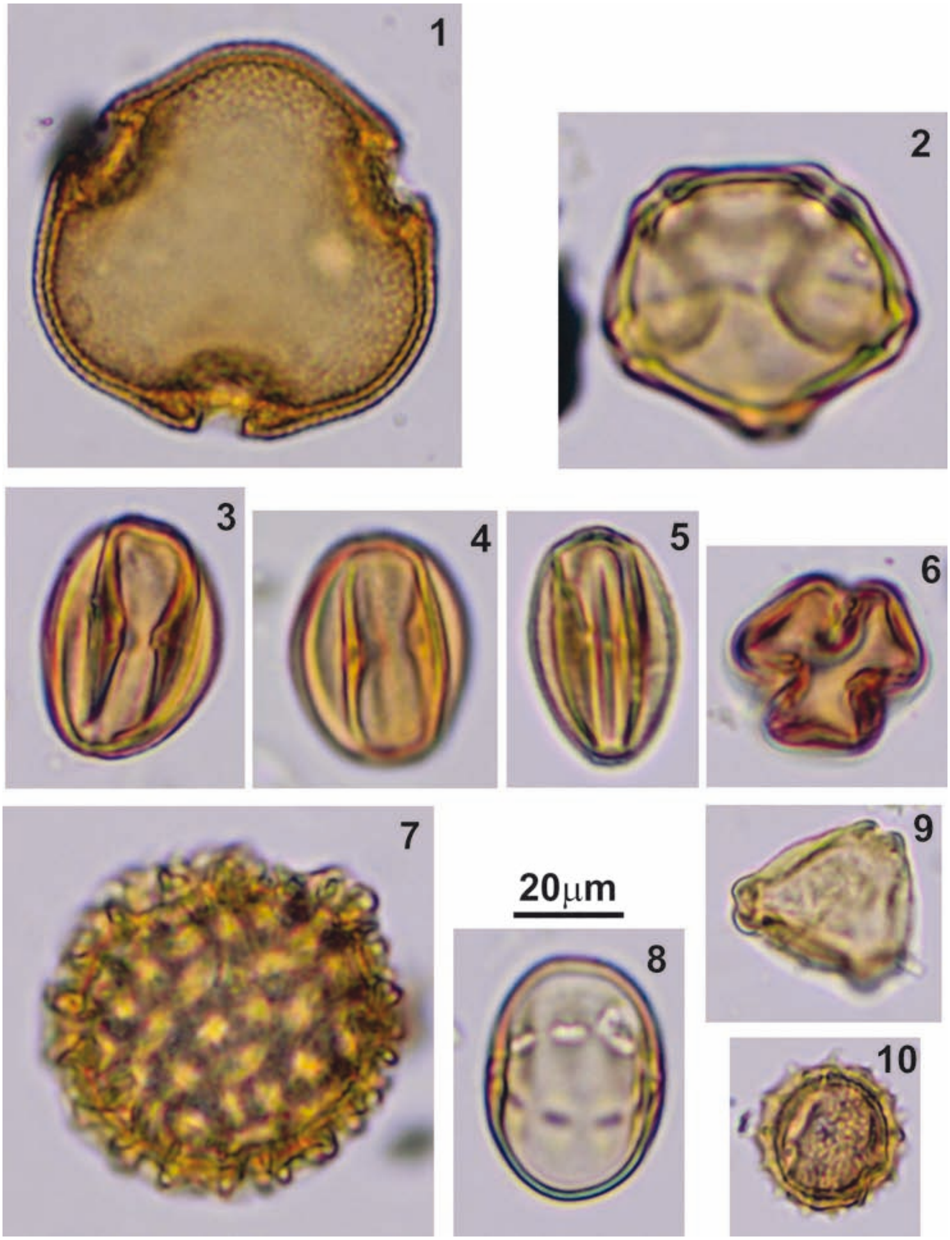

Fig. 4. Pollen grains from organic remains of Namcheduri II settlement (sample No 2, 3):
1 – *Tilia;* 2 – *Alnus;* 3-6 – *Vitis vinifera;* 7 – *Polygonum persicaria;* 8 – *Symphytum*); 9 – *Betula;* 10 – *Achillea*

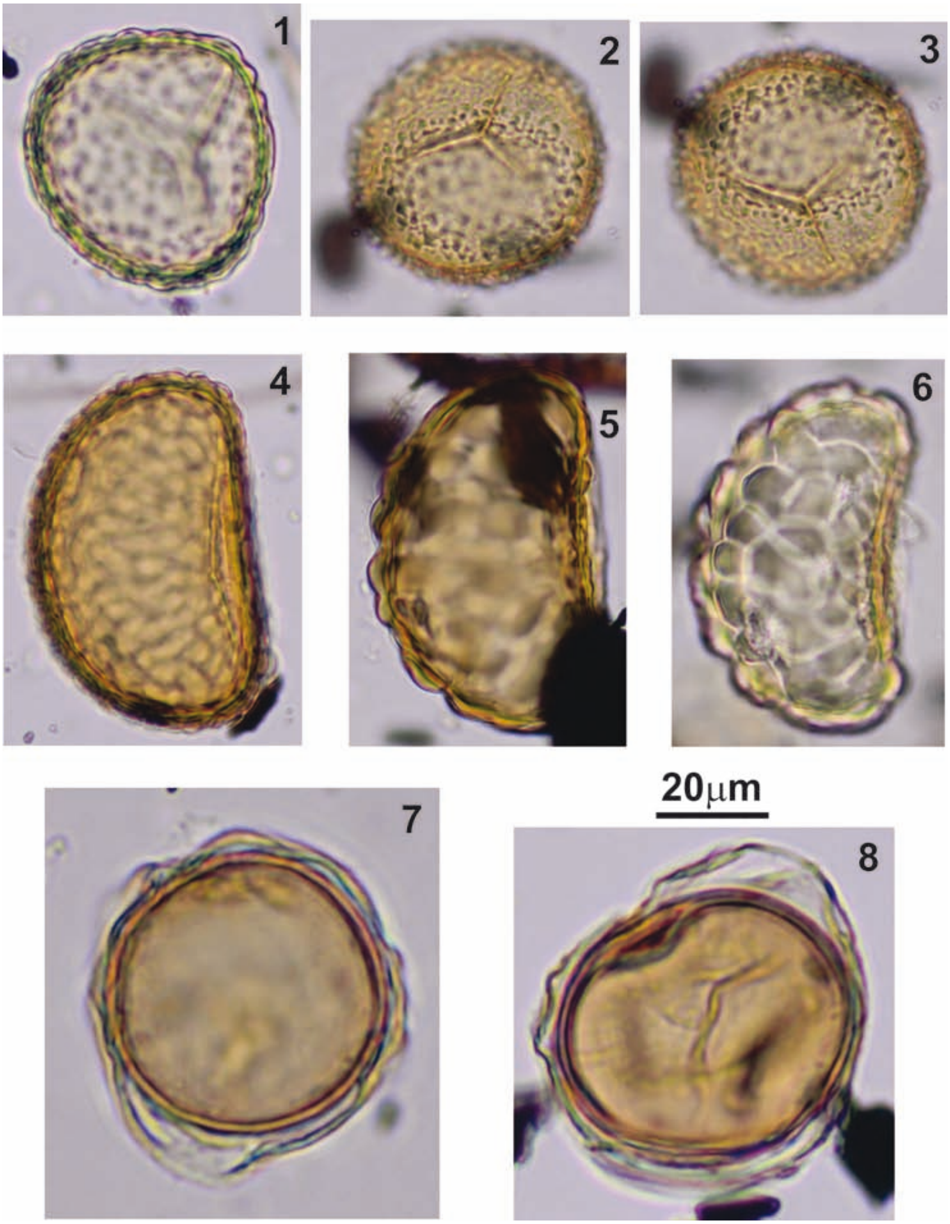

Fig. 5. Fern spores from organic remains of Namcheduri II settlement (sample No 2, 3):
1 – *Ophioglossum vulgatum;* 2, 3 – *Osmunda regalis*; 4 – *Polypodium serratum;* 5, 6 – *Polypodium vulgare;* 7, 8 – *Equisetum*

Fig. 6. The eggs of the parasitic worm from sample No2,3 of Namcheduri II settlement:
1, 2 – *Capillaria;* 3-5 – *Enterobius vermicularis;* 6, 7 – *Trichuris trichiura*; 8, 9 – *Ascaris lumbricoides*

Charcoaled cells of wood, fungal spores, and starch prevailed among non-pollen palynomorphs (Table 1). Fibres of linen and cotton fabric were rather well represented. Remains of phytoliths, zoomaterials and an aquatic plant *Pseudoschizaea* were defined in small amounts.

The sample collected from the plaster (*sample No. 5*). Its palynological spectrum appeared extremely poor. Pollen grains and spores of only 13 plants were found. Of arboreal plants, there were pollen grains of spruce (*Picea*), pine (*Pinus*), beech (*Fagus orientalis*), alder (*Alnus*), hornbeam (*Carpinus betulus*), and chestnut (*Castanea sativa*). There were relatively few of herbaceous plants. Cereals for sowing (Cerealia), wild grasses (Poaceae), knot-grass (*Polygonum*), cockleburs (*Xanthium*), nettles (*Urtica*), Apiaceae, and ferns (Polypodiaceae) were evidenced. Remains of non-pollen palynomorphs were well represented. Disintegrated cells of wood dominated. Wood parenchymal cells of pine and elm were defined. Lots of cereal starch and fungal spores were found. Fibres of linen fabric were well represented. Cotton fibers were numerous. Microscopic residues of insects and ticks were few.

Pollen spectra of modern soil (*sample No. 1*). Pollen grains of artificially planted coniferous plants, widely spreading in the region under discussion, prevailed in the palynological spectrum of the sample collected from the present-day soil. Among them were: cryptomeria (*Cryptomeria*), cedar (*Cedrus*), spruce (*Picea*), and some species of pine (*Pinus*). Various species of spruce and pine occurred in the soil from the artificially planted coniferous plants which were brought from various countries for decorative purposes.

Elements of forest massifs naturally preserved here were well represented in the palynological spectrum of the soil. First of all, among them were groves where alder (*Alnus barbata*), wing-nut tree (*Pterocarya fraxinifolia*), and willow (*Salix*) grow. Besides, pollen grains of beech (*Fagus orientalis*), oak (*Quercus*), hornbeam (*Carpinus betulus*), elm (*Ulmus*), and chestnut (*Castanea sativa*) were evidenced in the spectrum. Of herbaceous plants, pollen grains of the weeds, growing at rubbish places or by roads and paths, prevailed. Among them were cockleburs (*Xanthium*), wormwood (*Artemisia*), great plantain (*Plantago*), Cyperaceae and wild grasses (Poaceae). Pollen grains of maize were in small amounts. There were nearly no pollen grains characteristic of areas under crops or gardens. The composition of the non-pollen palynomorphs of the soil spectrum was absolutely different. Starch dominated, especially starch of the field cereals. There were many fungal spores but the fungus Glomus (*Glomus*) was evidenced only here. This fungus grows only in erosive, dug soil, and in this case, there is a trace of human activity (van Geel 1998). Besides, rather great amounts of fungus *Brachysporium* were determined. This fungus grows on the wood of a dead tree (van Geel 1998). There were found remains of moss as well. Microscopic residues of insects and other invertebrate were also evidenced in rather great amounts. Freshwater aquatic plants *Spirogyra*, *Pseudoschizaea* were present in small quantities.

As was mentioned above, samples No. 2 and No. 3 were characterized by their absolutely different palynological spectra compared to those collected from the floor or the plaster (Fig.

2, 3). Pollen grains and spores of 45 plants were identified in the two aforementioned samples. Of them, 18 belonged to arboreal plants and bushes, while 27 – to herbaceous plants.

These figures represent very high benchmarks, since it is well known that, generally, archaeological material is characterized by a low composition of pollen grains. In addition, it should be determined that only 20 taxa were identified in the sample collected from the floor, and a much smaller number – in the plaster sample, where pollen grains of 13 plants were defined.

Preservation of pollen grains and spores in the samples Nos 2, 3 was exceptional. This is clearly visible in the presented photos (Figs. 4 and 5). The same picture is presented in the group of non-pollen palynomorphs in which both taxonomic composition and quantity of taxa reach higher levels. Thirty types of fossilized non-pollen palynomorphs were identified in samples No. 2 and No. 3, while only 12 – in each sample collected both from the floor and the plaster (Table 1).

DISCUSSION

The palynological description of the presented material has shown that the studied samples drastically differ. One clear conclusion is the absence of any traces of contamination of the archaeological samples by the present-day soil. The latter is absolutely of different type. Both the present-day landscape plants, among which prevail preserved segments of mixed deciduous forest (Nakhutsrishvili 1999; 2013; Zazanashvili *et al.* 2000) and such kinds of introduced decorative species as, for example, various species of cedar (*Cedrus*), cryptomeria (*Cryptomeria*), spruce (*Picea*), and pine (*Pinus*) are evidenced in it.

As for the herbaceous plants, the weeds that widely spread on areas abandoned by humans, prevail in this group. Cockleburs (*Xanthium*) and knot-grass (*Polygonum aviculare*) are the best examples of this. As has already been noted this area is not inhabited nowadays.

Comparison of the palynological spectra of the organic residues collected from the settlement of Namcheduri II reveals many interesting facts. Taking into consideration the studied palynological spectra, the first two samples (Nos 2 and 3) that are connected to the beams drastically differ from those obtained from the floor and the plaster (Fig. 2, 3). Pollen grains of edible plants prevail in the palynological spectra of these samples, especially of wheat and other field cereals. Here pollen grains of chestnut are evidenced as well.

The palynological research of the archaeological material prove that any edible plant food contains pollen grains of these plants. For instance, plenty of pollen grains of wheat and other cultivated cereals, phytoliths and starch are found in the cereal porridges, remains of which are found in archaeological vessels or in the abdominal areas of the deceased (Kvavadze and Narimanishvili 2006; Kvavadze *et al.* 2010a, 2020; Kvavadze and Martkoplishvili 2018).

It is of great interest that pollen grains of wheat and starch are preserved in fossilized flour and products made of it. The bread and biscuit found in the Early Bronze barrow No 2 at Tetritsqaro, Georgia, dated to 2474-2335 BC, represent the best examples of this. These artefacts are preserved in the reserves of the Georgian National Museum (Kvavadze *et al.* 2016; Kvavadze *et al.* 2020).

Plant pollen grains also accompany human drinks. Research has proved that, for instance, great amount of grapevine pollen grains existed in the archaeological vessel, in which wine was kept (Rösch 2005; Kvavadze *et al.* 2010b; 2014; 2019; 2020; Bitadze *et al.* 2011; Chichinadze *et al.* 2012; McGovern *et al.* 2017). The abundance of pollen grains of melliferous plants in ancient vessels, represents good evidence for the existence of honey there (Rösch 1999; Pokorny and Marik 2006; Kvavadze *et al.* 2007; Kvavadze 2016; Chichinadze *et al.* 2017; 2019).

Numerous plants defined in both the studied samples obtained at the Namcheduri II settlement belong to edible ones. Of arboreal species, there are chestnut (*Castanea sativa*), beech (*Fagus orientalis*), oak (*Quercus*), walnut (*Juglans regia*), hazel (*Corylus*), grapevine (*Vitis vinifera*), blackberry (*Rubus*), and guelder rose (*Viburnum*). Of herbaceous plants, there are well-known herbs such as goosefoot (*Chenopodium album*), nettles (*Urtica*), thistle (*Carduus*), wild sorrel (*Rumex*), Cichorioideae (Rivera *et al.* 2012a, b). Thus, to sum up, the pollen grains of 14 edible plants are evidenced in the spectrum.

Nearly all of the rest of the palynological spectrum components represent pollen grains and spores of plants that have medicinal uses. Their number reaches 32, exceeding twice the number of taxons of the edible plants. These data might imply that the population of the period in question had certain health problems. Of arboreals, 11 are medicinal plants, while 17 – herbaceous ones.

Pollen grains of alder (*Alnus*) prevail. This plant is used for treatment of gastrointestinal diseases even today, namely of dysentery (Duke *et al.* 2002; Quattrocchi 2012). Pine (*Pinus*), fir-tree (*Abies*), and spruce (*Picea*) are used for treatment of respiratory organs. All three taxa are well presented in the palynological spectrum. Drugs prepared from flowers, cones, and conifer needles are used for treatment of lung inflammation, tuberculosis, asthma, and other respiratory diseases in folk medicine (Khare 2007; Alarcon *et al.* 2015; Bussmann *et al.* 2016).

Discovery of pollen grains of lime (*Tilia*) and birch (*Betula*) in the palynological spectrum of our sample indicates that the ancient population was familiar with the medicinal properties of these plants, particularly with their temperature reducing property (Demiray 2009; Güler *et al.* 2015). Birch is also used against epilepsy and cystitis (Adams *et al.* 2012; Papp *et al.* 2014). Juniper (*Juniperus*) is also used for treatment of epilepsy (Alarcon *et al.* 2015). It also is evidenced in the palynological spectrum, however, in a small quantity. There are quite a lot of pollen grains of hornbeam (*Carpinus betulus*) in the palynological spectrum. Drugs used against diarrhoea, skin diseases and for reducing temperature are prepared from its bark (Hatfield 2004; Quatrocchi 2012).

Decoction of willow (*Salix*) leaves and its bark is a good remedy for treatment of malaria (Norn *et al.* 2009; Rivera *et al.* 2012b). Pollen grains of elm (*Ulmus*) and Zelkova tree (*Zelkova*) are rather well evidenced in the palynological spectrum. The medicinal properties of the zelkova tree are under investigation by pharmacologists. Its pollen grains are frequently encountered in ancient rubbish pits, on scrubbing stones, and in the abdominal areas of the deceased (Bitadze *et al.* 2011; Chichinadze *et al.* 2019; Kvavadze *et al.* 2020). Pollen grains of the zelkova tree are found in an Early Bronze Age wooden box, containing plenty of first aid drugs (Kvavadze *et al.* 2013; 2015). Therefore, since the elm and zelkova tree belong to one and the same genus, their medicinal properties could be similar. Research shows that a remedy is prepared from the leaves and shoots of elm used as an expectorant as well as for the healing of wounds and burns (Khare 2007; Kültür 2007). The same properties could be characteristic of the zelkova-tree.

Plenty of medicinal plants are in the composition of herbs, of which ones with properties to cure diarrhoea are represented in a greater variety (Alacron *et al.* 2015; Fortini *et al.* 2016). Among them are: yarrow (*Achillea*), saw-wort (*Serratula*), comfrey (*Symphytum*), hemp (*Cannabis sativa*), and ribwort (*Plantago lanceolata*). Plants used against rheumatism and arthritis are also well presented in the pollen spectra (Said *et al.* 2002; Dahui 2012; Wiersema and Leon 2013). Cornflower (*Centaurea*), wormwood (*Artemisia*), and teasel (*Dipsacus*) belong to them. Wormwood (*Artemisia*) is a good remedy against malaria (Hayta *et al.* 2014; Bussmann *et al.* 2016). As for the cornflower (*Centaurea*), along with arthritis and rheumatism, it treats diarrhoea, various gastro-intestinal diseases, and inflammations (Al-Snafi 2015a). Saw-wort (*Serratula*), is also used for treatment of diarrhoea (Uphof 1968; Adnan Hölscher 2010). Teasel (*Dipsacus*) is a good medicinal plant for rheumatism, asthma, and diarrhoea (Dahui *et al.* 2012; Wiersema and Leon 2013).

Pollen grains of the Caryophyllaceae family are widely presented in the palynological spectrum of the human faeces from the latrine found at Namcheduri II (Fig. 2). Many representatives of this family have medicinal properties (Chandra and Rawat 2015), namely they treat cancer, inflammation, fungal and viral diseases. Besides, they have antibacterial and antioxidant properties (Chandra and Rawat 2015).

Pollen grains of plants treating diabetes are presented in small amounts. Of them, only yarrow is evidenced (Alarcon *et al.* 2015; Fortini *et al.* 2016). The two plants – goosefoot and nettles – previously included in the group of nutritive plants should be specially noted. Goosefoot (*Chenopodium album*) is widely used for treatment of plenty of diseases. Among them are arthritis, rheumatism, diarrhoea, uremia, abdominal pains, and helminthiasis. Rather rich literature exists concerning this issue (Jabbar *et al.* 2007; Yadav *et al.* 2007; Altundađ and Özhatay 2009; Egamberdieva *et al.* 2012; Meuninck 2013; Polat *et al.* 2015; Bibi *et al.* 2014; Al-Snafi 2015b). Nettles (*Urtica*) are very popular in the ethnomedicine, being used for treating rheumatism, asthma, bleeding, inflammation and anemia. There is much research dedicated to these issues (Asgarpanah and Mohajerani, 2012; Quattrocchi

2012; Wiersema and León, 2013; Bibi *et al.* 2014; Zlatović *et al.* 2014; Fontini *et al.* 2016; Kregiel *et al.* 2018).

As for the spore plants, including 8 taxons in their group, nearly all of them are also used in the folk medicine. For instance, horse-tail (*Equisetum*) that is well represented in the spectra, was a remedy used in the Middle Ages and in the course of the whole historic period to defeat rheumatism, however, later research has revealed that horse-tail can also be used to fight against cancer, diabetes, pain, and fungal diseases (Asgarpanah and Rochi, 2012). Adder's fern (*Polypodium vulgare*) is a good painkiller. Lots of its spores are also in human faeces from latrines (Said *et al.* 2002; Allen and Hatfield 2004; Black 2004; Kültür *et al.* 2007; Jarić *et al.* 2011; Dar *et al.* 2012; Quattrocchi 2012; Wiersema and León 2013). Besides, it treats asthma, skin diseases, and comprises a good expectorant (Kvavadze *et al.* 2020). Fern adder's tongue (*Ophioglossum vulgatum*) is a good antiseptic remedy. Its spores were defined in the recently obtained material (Duke *et al.* 2002; Allen and Hatfield, 2004; Hatfield, 2004; Mannan *et al.* 2008; Quattrocchi 2012). The woolly bracken (*Pteridium aquilinum*) also is known to have antiseptic properties; in addition, it is used for treatment of inflammation, angina, and rheumatism (Vetter 2010; Menale and Muoio 2014; Baydoun *et al.* 2015; Fontini *et al.* 2016). Royal fern (*Osmunda regalis*) is used against rheumatism. Its spores are also discovered in recently found organic remains (Molina *et al.* 2009). It is notable that today fern *Pteris cretica* is used against cancer and other types of tumour (Kiran *et al.* 2018).

As already noted, eggs of parasitic worms of several types were evidenced in the group of non-pollen palynomorphs (Table No 1 and Fig. 6). Eggs of the nematode *Trichuris trichiura* prevailed in it. This kind of helminthosis is considered a tropical disease as its spread is more frequent in tropical and subtropical zones. Eggs of *Trichuris trichiura* ripen only in warm and wet climatic conditions (Araújo *et al.* 1981; Bouchet 2003). It is remarkable that in the territory of Georgia traces of *Trichuris trichiura* have been discovered in Upper Palaeolithic layers (Kvavadze *et al.* 2011). This period was characterized by the climatic optimum of the Late Glacial period. Eggs of *Trichuris trichiura* were encountered in the habitation layers of the Neolithic site of Gadachrili Gora (Kvavadze *et al.* 2014) as well as by the sacrum of a buried individual in the Early Bronze Age barrow of Ananauri (Kvavadze 2016). In all these periods, as well as in the Classical Period of western Georgia, the climate was warm and humid, causing the spread of trichuriasis (Chichinadze *et al.* 2019; Kvavadze and Chichinadze 2020).

Plenty of eggs of ascaris (*Ascaris lumbricoides*) are in the palynological material (Table No 1). Eggs of parasitic worms *Capillaria*, *Enterobius vermicularis*, *Yokogava fluke* are presented in small amounts (Figs. 3 and 6). Traces of all aforementioned helminths were found for the first time in the archaeological layers dated to the Classical Period of Georgia. It should be noted that eggs of *Trichuris trichiura*, *Capillaria*, *and Ascaris* were discovered in the Hellenistic layers of the Elaia site in Turkey (Shumilovskikh *et al.* 2016). Of great interest is the fact that, as in Namchederi II, the Elaia spectrum of non palynological palynomorps is dominated by the *Trichuris trichiura* eggs.

The abundance of eggs of parasitic worms in the obtained material from Namcheduri II gives grounds for supposition that this part of the settlement was used as a latrine or a cesspit.

CONCLUSION

The palynological study of the layers at the site of Namcheduri II dated to the Classical Period have shown that the population in the period in question actively consumed products made of cereals and even preferred such food. Chestnut also occupied a significant part in the human diet. Hazel, walnut, acorn, and beech fruits were used as food by the ancient population. They used grapes and products made of it. They are blackberries, guelder rose, and, possibly, other kinds of berries as well.

Evidently ethnomedicine was at a rather high level of development in the period under discussion since remains of plenty of medicinal plants were discovered in fossilized human faeces. The analysis of the examined palynological materials showed that the majority of them represent medicinal remedies of rheumatism and arthritis.

Residues of medicinal plants treating diarrhoeal and other gastrointestinal diseases abound in the material. From our point of view, this abundance was stipulated by the widespread of helminthiasis closely connected to the humid and warm climatic conditions. It is well known that the wet and warm soil preserves eggs of parasitic worms for a long period of time.

Spreading of malaria is connected to wet climatic conditions. Its existence is proved by discovery of medicinal plants used for treatment of malaria in the palynological spectrum.

Of great interest is the fact that, according to the composition of the revealed medicinal plants, epilepsy and diabetes were not widely spread in the population of the period in question.

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