

A COMPARATIVE TECHNOLOGICAL STUDY OF THE NEOLITHIC BURNISHED POTTERY FROM VĂDASTRA AND CRUȘOVU (ROMANIA)

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Abstract: This text consists in a comparative analysis of two categories of burnished Neolithic pots originating in two sites that belong to Vădastra tradition (ca. 5200-4900 CAL. BC), namely the eponymous settlement and that at Crușovu (Oltenia, Romania). The analysis results showed that the same pottery technology was used in both sites.

Keywords: pottery technology; Neolithic; Vădastra tradition; Vădastra - "Măgura Fetelor"/"Dealul Cișmelei"; Crușovu.

Rezumat: Textul de față constă într-o analiză tehnologică comparativă a două categorii de vase lustruite neolitice provenite din două situri aparținând tradiției Vădastra (cca. 5200-4900 CAL. BC), și anume așezarea eponimă și cea de la Crușovu (Oltenia, România). Rezultatele analizei au indicat faptul că pe ambele situri a fost utilizată aceeași tehnologie ceramică.

Cuvinte-cheie: tehnologie ceramică; neolitic; tradiția Vădastra; Vădastra - „Măgura Fetelor”/„Dealul Cișmelei”; Crușovu.

Introduction

The Vădastra tradition from south of Romania and north-west Bulgaria was attributed to the Middle Neolithic period and dated ca. 5200-4900 CAL. BC¹. Research of the Neolithic pottery technology in the eponymous settlement (Olt County, Oltenia) showed that the clay was taken from the outcrops nearby the settlement and that vegetal material was used as temper². The pots were modelled into certain proportional shapes, sizes and thickness. The burnished black pottery, fired in reducing atmosphere and ornamented with incised and excised motifs was decorated with white paste and ochre, both substances coming from local sources and in the case of some of the ochre, from sources located at a distance³. One of the themes, not discussed insofar, is whether the Vădastra Neolithic pottery technology was developed within the settlement or was brought by the potters working in this tradition. The lack of pottery waste exhibiting deformation or deep cracking suggests that the pottery technology was brought to the settlement and adapted to local clay sources, demand of certain vessel shapes, and to possible changes due to its transmission over time, from one generation of potters to another. By comparing two sites of the Vădastra tradition (Fig. 1), we aimed at identifying possible adaption of the pottery technology to the local conditions or, on the contrary, the less likely establishment of a new technology.

¹ Regarding the dating, see for instance Mantu 1999-2000; Krauß 2008.

² Găță, Mateescu 1992a; Găță, Dragoman 2004-2005.

³ Găță, Mateescu 1987; Găță, Mateescu 1992b; Găță, Mateescu 1999-2001.

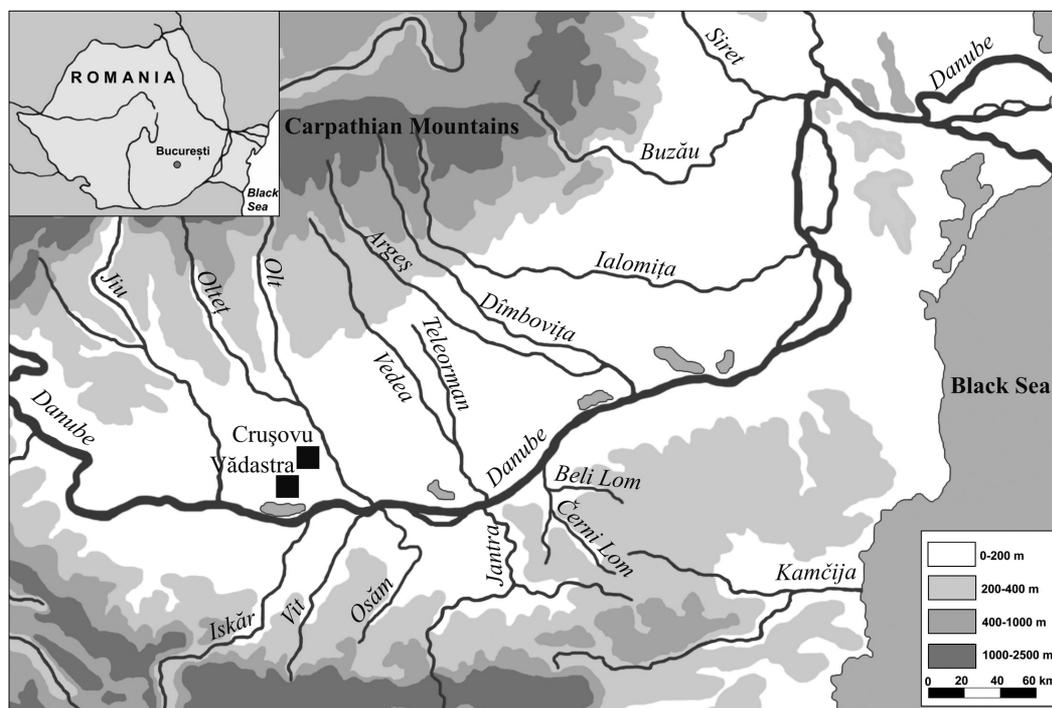


Fig. 1. Location map with Vădastra and Crușovu sites.

Materials and methods

Two categories of burnished pottery from the Neolithic settlements at Vădastra and Crușovu (Olt County, Oltenia) were chosen for analysis. Weight, thickness, diameter and porosity were determined in all pottery fragments and the porosity index was computed as a porosity-section ratio.

Colour was specified with the aid of Munsell charts by the B.B. = (10-c) H/V formula, where “B.B” is the darkening degree, “H” is colour; “c” is chroma and “V”, the hue value.

The comparison of clay sources and pottery masses was made based on quartz (4.26 Å) and mica (4.97 Å) X-ray diffraction beam levels. An additional test used, for the same purpose, the total content of nickel and cobalt, obtained by acid disaggregation and determined by atomic absorption⁴. The presence of Kaolinite in the samples was assessed by the 3690 cm⁻¹ infrared absorption band and micaceous minerals by the 10 Å to 4.97 Å X-ray diffraction beams.

Pottery

The settlement at Vădastra - “Măgura Fetelor”/“Dealul Cișmelei” is located at 14 km north-west the city of Corabia, in the Oltenia Plain, on the Băilești mid terrace of

⁴ Total nickel and cobalt were determined by atomic absorption subsequent the disaggregation of the samples via a hydro fluoric and sulphuric acid mixture. Being comprised of crystalline silicate networks, these two microelements were chosen due to their stability in case of alteration.

Danube. The site stratigraphy was established following the excavations performed by Corneliu N. Mateescu, with occasional breaks, starting with 1946 until 1974: a Palaeolithic layer (Aurignacian); an intermediary layer with no archaeological materials; two Neolithic layers which the author named Vădastra I and Vădastra II; a layer dating to the Copper Age (Sălcuța); and the lower part of a 14th and 17th-18th centuries layer⁵. According to C. N. Mateescu, Vădastra I layer is defined by a burnished dark/grey pottery, undecorated or decorated with channelled motifs⁶, while layer Vădastra II is characterised by a burnished dark/grey or brownish pottery, decorated with incised and excised motifs inlaid with white paste and painted with red ochre⁷ (Fig. 2/1-2). Occasionally, the channelled and excised decoration are associated on the same vessel; in C. N. Mateescu's view, these fragments always come from the upper part of Vădastra I layer⁸.



Fig. 2. Burnished vessels at: 1-2. Vădastra; 3-4. Crușovu; 1, 3. Vessels decorated with channelled motifs ; 2, 4. decorated with incised/excised motifs.

⁵ For instance Mateescu 1971.

⁶ E.g. Mateescu 1961.

⁷ E.g. Mateescu 1965.

⁸ E.g. Mateescu 1961, 533.

The settlement at Crușovu is located at 19 km north-west of Corabia, between the Oltenia Plain and the upper terrace of Olt river. The same C. N. Mateescu carried out a sondage there in 1955⁹. Excavations at Crușovu were performed by C. N. Mateescu according to the same research methods as in Vădastra. The archaeologist even employed some of the workers from the Vădastra team¹⁰, already accustomed with his work method. C. N. Mateescu identified two Neolithic layers, named them Vădastra I and Vădastra II as well, some Roman pits and two huts dated to the end of the 18th century and early 19th century¹¹. As resulting from the published report, similarly to the settlement at Vădastra, layer I is characterised by a burnished pottery decorated with channelled motifs and layer II by a burnished pottery decorated with incised and excised motifs, and painted with ochre (Fig. 2/3-4). In C. N. Mateescu's view, the fragments onto which channelled motifs associate with those excised "make, stylistically, the transition - stratigraphically confirmed - between Vădastra I and Vădastra II"¹².

In the case of the channelled burnished pottery, only the upper part of the recipients is usually decorated. On vessel necks, the channellings are placed either horizontally or in zigzag, occasionally associated with triangles formed by impressions; on the pots' maximum diameter, decorative motifs consist of vertical, oblique, braquet or spiralled-shaped channellings, associated sometimes with impressions. Red ochre appears on some of the sherds; the substance analysis highlighted that 32% of the samples labeled Vădastra I were painted after firing¹³. A human face was applied on one of the pots. Some vessels exhibit two or four knobs on the maximum diameter; sometimes, they are perforated vertically, for instance in the case of some of the cups. The inner surface of the vessels was also frequently burnished. To this pottery category belong open shapes such as cups, beakers, bowls, footed vessels and, to use a term adopted from L. Thissen¹⁴, "drinking bowls", but also closed shapes, such as jars¹⁵.

In the case of the incised and excised burnished pottery, the recipients are decorated almost entirely with meanders, spirals, rhombs or rectangles. The incisions and excisions were filled with white paste. Undecorated vessel surfaces (the rim, the base, the body portions located in-between the decorated segments) were covered with red ochre; most frequently, ochre was applied before firing - only in 6% of the samples labeled Vădastra II ochre was applied after firing¹⁶. Several fragments belongs to pots with human faces or heads. On some of the sherds, the incised/excised decoration associates with incised stripes filled with dots and inlaid with white paste - the so-called "Vinča" decoration. In one case, the incised/excised decoration associates with an alveolate band specific rather to the surface-roughened pottery. The inner

⁹ Mateescu 1957.

¹⁰ Gheorghiuța Grădinaru and M. Ion Grădinaru, former workers for C. N. Mateescu, personal communication, Vădastra, August 2008.

¹¹ Mateescu 1957.

¹² Mateescu 1957, 106.

¹³ Găță, Mateescu 1999-2001, 188.

¹⁴ Thissen 2008, 106, 108.

¹⁵ For the site at Vădastra, see Dragoman 2010.

¹⁶ Găță, Mateescu 1999-2001, 188.

surface of the vessels is either burnished or smoothed. This pottery category includes open shapes like bowls, dishes, plates, four-legged vessels, footed cups or pedestalled vessels, and closed shapes like storage vessels; lids are also present¹⁷.

In his publications, C. N. Mateescu named the burnished dark-grey undecorated or channelled-decorated pottery as “Vădastra I” and the burnished dark-grey or brownish pottery with incised and excised decoration as “Vădastra II”. Nevertheless, it is worth mentioning that despite the evolutionist view adopted by C. N. Mateescu, within contexts discovered precisely in layer I in the settlement at Vădastra, like for instance Pit I/1946 or the Pit in squares 4-15/1971, both identified on “Măgura Fetelor”, the two categories coexist. Herein, in order to avoid a too often recurrence of the term “Vădastra” (associated with both pottery categories from the two discussed settlements, as well as with the eponymous site) and for an easy reading, we used “pottery D” and “pottery F” respectively instead of the “Vădastra I” and “Vădastra II” terms.

Clay sources

Pottery clay sources could differ texturally and mineralogically from one settlement to another, requiring changes in fabric technology, even though the vessels’ modelling, shape, drying and firing resemble. Quartz (4.26 Å) and micaceous minerals (4.97 Å) diffraction beam levels were used to compare clay sources with pottery materials. The chart of these quartz-micaceous minerals beam levels (Fig. 3)

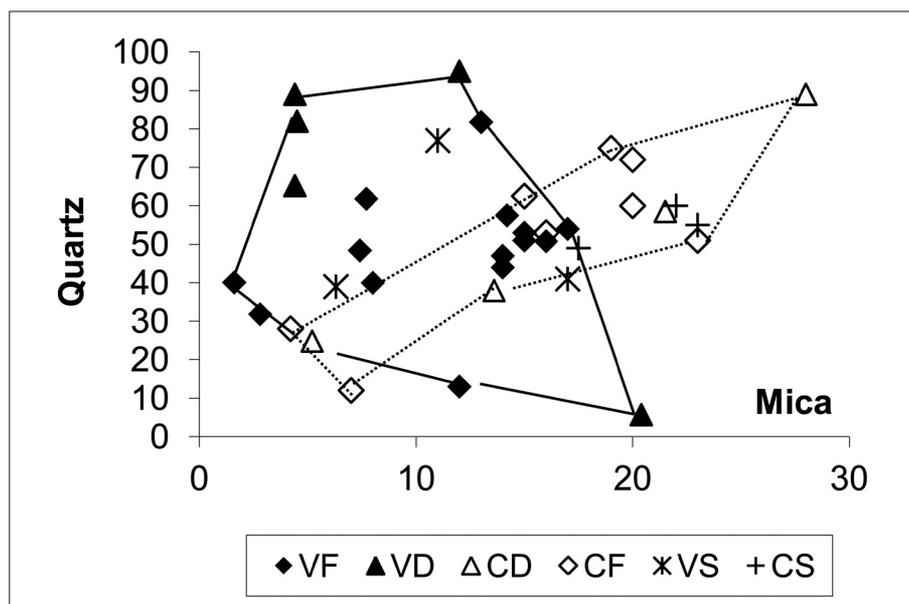


Fig. 3. Distribution of Vădastra and Crușovu clay sources and sherds.

shows that the areas of the pottery materials from the two settlements partially overlap, each also comprising points corresponding to the presumptive clay sources, since the quartz content increase is proportional to the clay fraction content decrease. Given

¹⁷ For the site at Vădastra, see Dragoman 2010.

that chart areas partially overlap, one may conclude that the fabric sources texture is similar, and, from Vădastra to Crușovu, varies from clayish sand to sandy clay. Hence, there were tested several microelements and observed that a chart using the total cobalt and nickel content in the presumptive sources and pottery materials can better divide both the samples and sources from the two settlements (Fig. 4). This could be used in the research of certain vessels' distribution in-between these settlements, provided this occurred in the Middle Neolithic from south Oltenia. The two presented charts indicate that clay sources are in the close vicinity of the two settlements and that their texture and mineral composition is similar to the clay used by modern potters.

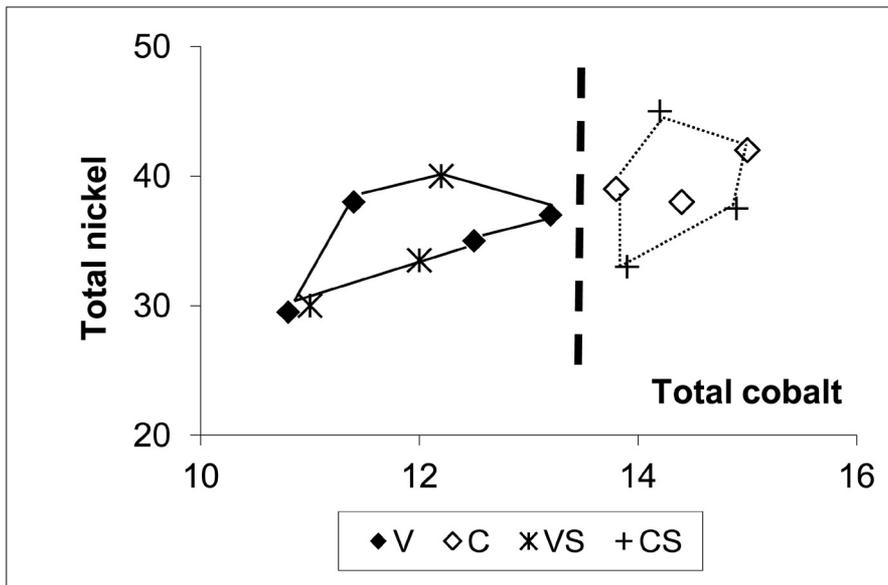


Fig. 4. Distribution of clay sources and sherds according to total nickel and cobalt contents.

Tempering

The clay for pottery was kneaded twice. Initially, water was added to the clay little by little and it was kneaded so to form a fabric whose consistency allowed modelling. A part from this paste was removed and added some amount of crushed vegetal mass as temper, in order to prevent cracking when drying and firing. The amount of crushed plants (vegetal material) added to the paste, the consequent tempering and flattening in order to model vessels, was made according to each potter's own experience and the tradition inherited from the successive generations of potters in the settlement.

The first part of the fabric was used for modelling vessel bases, subsequent flattened coils being glued one after the other to the already modelled vessel parts, while continuously smoothing vessel walls so that pieces would adhere to each other well and remove any possible holes; still, such holes appear in microscopic sections. Owing to this pottery modelling fashion (i.e. the coiling technique), great differences in the

crushed plants-fabric ratio could result from one potter to another or from one potter generation to another.

Crushed plants increase, upon firing, the holes' volume and hence, porosity. Moreover, it is possible that Neolithic potters added different amounts of crushed plants to each of the vessel parts or depending on the walls' thickness or vessels' size. In order to confirm such suppositions, we represented the porosity-thickness ratios in some of the rims, bodies and bases of type D vessels from Cruşovu (Fig. 5).

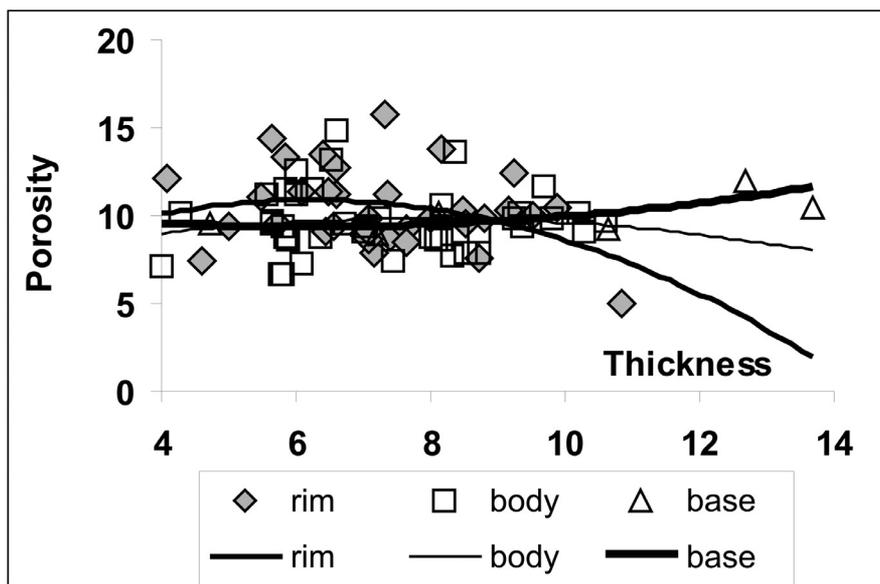


Fig. 5. Porosity and thickness ratio of Vădastra and Cruşovu D type sherds.

The representative points for the three vessel parts are mixed up and string on a band quasi-parallel to the abscissa. Porosity differences at same thickness vary between 5% and 8%, being indicative of high technological tolerance compared to thickness and suggest that Neolithic potters tempered the paste of all vessel parts in the same manner. Such high tolerance shows that Neolithic potters were not concerned with adding to paste amounts proportional to the vessel walls thickness. The practice is confirmed by the lack of porosity and thickness correlation in the case of the entire group of sherds ($n = 82$, $R_{poly} = 0.052$, $R_{lin} = 0.008$, $F = 0.005$), vessel bodies ($n = 40$, $R_{poly} = 0.095$, $R_{lin} = 0.040$, $F = 0.061$), and poor correlation in vessel rims ($n = 35$, $R_{poly} = 0.341^*$, $R_{lin} = 0.260$, $F = 2.39$) and vessel bases ($n = 7$, $R_{poly} = 0.729$, $R_{lin} = 0.683$, $F = 4.37$).

In order to compare the sherds selected from the settlements at Vădastra and Cruşovu, in table 1 are presented statistical data regarding some of their properties. In the settlement at Cruşovu, all mean values of type D pottery are smaller than those for the type F pottery, except for the porosity index. This would suggest that crushed plants addition to paste ratio was better controlled by potters for the type F pottery, whose sizes, walls thickness and porosity are higher. At Vădastra, the sizes and walls thickness, except for the porosity index of F type pottery compared to type D pottery, are higher. Thus, it results that the properties of the type D and F pottery from both settlements resemble,

with the note that the porosity index of the pottery in Vădastra is in general smaller than that at Crușovu. This would account for a certain improvement of the fabric technology with F type pottery compared to type D pottery in both settlements and would raise the question whether the F type pottery is partially later than type D pottery or that the incised/excised pottery required a more careful control of crushed plants tempering.

Properties	Number of samples	Mean value	Variation coefficient	Minimum	Maximum	Median
<i>Crușovu type D</i>						
weight	82	30.1	85.94	5.42	180.34	22.61
diameter		155.44	37.04	47.86	357.66	150
thickness		7.51	25.84	3.99	13.66	7.18
porosity		10.02	19.68	5	15.83	9.72
porosity index		1.43	31.73	0.77	2.94	1.29
<i>Crușovu type F</i>						
weight	96	44.24	118.79	4.95	371.52	27.06
diameter		247.38	40.4	52.58	565.29	239.77
thickness		9.85	25	4.78	16.63	9.86
porosity		10.98	17.95	6.93	16.25	10.85
porosity index		1.17	30.58	0.6	2.54	1.1
<i>Vădastra type D</i>						
weight	215	45.6	73.63	7.21	258.76	
diameter		186	33.42	61.35	381.56	173.57
thickness		7.8	24.34	3.13	13.54	7.6
porosity		9.89	21.22	3.75	17.33	9.63
porosity index		1.34	31.09	0.34	3.05	1.28
<i>Vădastra type F</i>						
weight	290	57.71	102.79	5.57	547.11	36.32
diameter		226.64	51.82	20.33	640.33	223.36
thickness		10.08	27.4	4.44	19.1	9.53
porosity		10.32	16.84	5.94	15.87	10.1
porosity index		1.1	32.67	0.44	2.3	1.06

Table 1. Statistic data on the analysed pottery.

Variation coefficients of sherd weights are over 70%, which might suggest that pots were unevenly fired, thus leading to variable resistance to mechanical shock. Instead, variation coefficients of porosity and porosity index are comprised between 20% and 33%, which show that, upon paste making, plants addition was taken into consideration by Neolithic potters.

All pottery properties vary within broad limits (with thick-walled large vessels in type F pottery from both settlements). Thus, one may appreciate that selected sherd groups are statistically representative upon first estimation.

Medians are always smaller than mean values and occasionally, almost equal; histograms are almost symmetrical with a slightly right asymmetry. For instance, the porosity distribution of type D sherds from Vădastra and Crușovu appears unimodal slightly left asymmetric (Fig. 6), with maximums close to 9.89% and 10.2%.

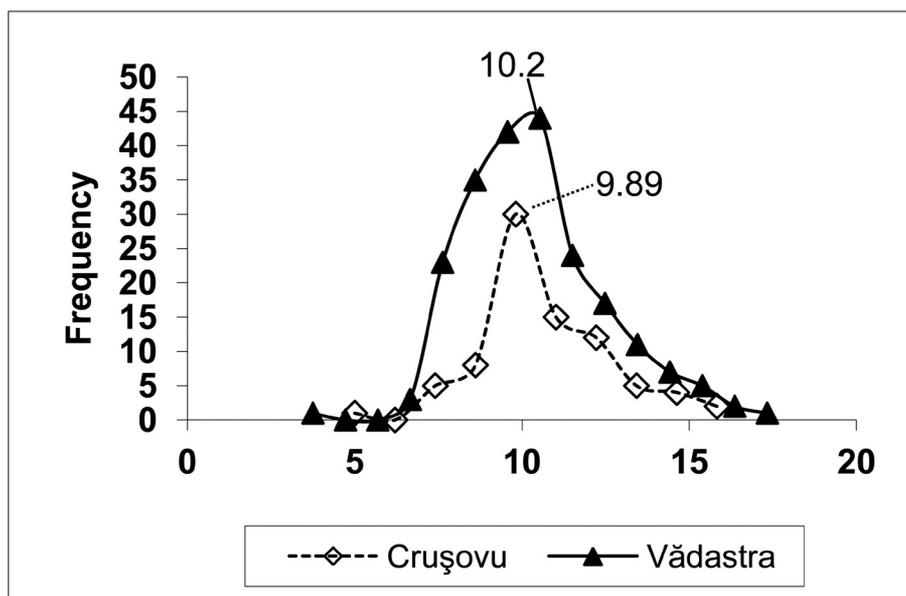


Fig. 6. Porosity distribution of Vădastra and Crușovu D type sherds.

Porosity does not correlate with F type sherds thickness from Crușovu ($n = 96$, $R_{poly} = 0.173$, $R_{lin} = 0.056$, $F = 0.3$) and poorly correlates with those at Vădastra ($n = 290$, $R_{poly} = 0.134^*$, $R_{lin} = 0.121^*$, $F = 8.04$). Representative points for the pottery in both settlements are mixed up and distributed all over the chart (Fig. 7).

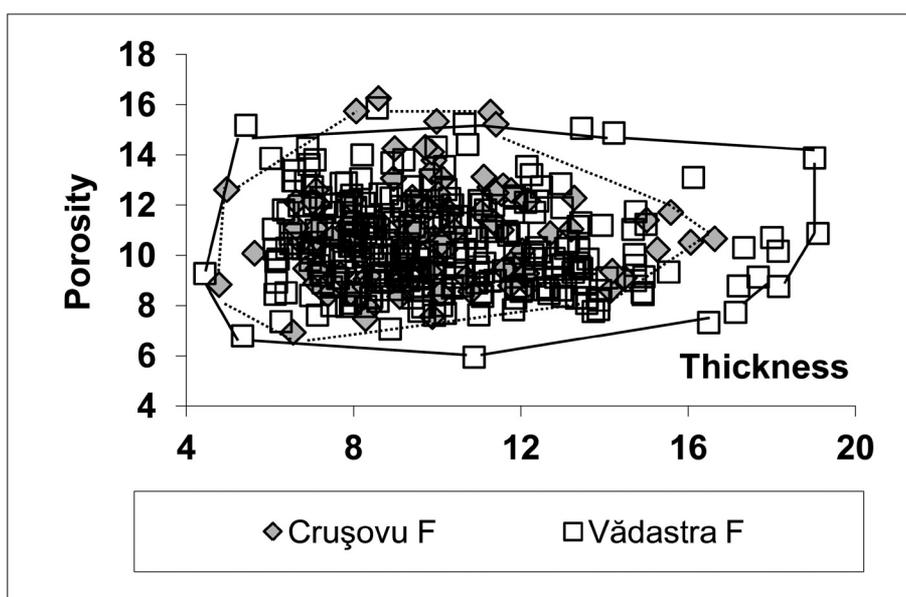


Fig. 7. Porosity and thickness ratio of Vădastra and Crușovu F type sheds.

Their areas are overlapping, that at Vădastra including almost entirely the area of Crușovu points. The porosity-thickness charts of the sherds show that the Neolithic potters did not add amounts of crushed plants proportional to the walls thickness of the vessels which they intended to model, but, rather, proportional to the volume of the clay piece they kneaded. Therefore, the crushed plants amount might be assessed by the sherds porosity and thickness ratio, i.e. the porosity index.

The distribution of the porosity index for the two pottery types (D and F) from Vădastra and Crușovu (Fig. 8) appears unimodal slightly right asymmetric. In type D pottery from the two settlements, the maximum frequency is identical (1.25%/mm), the two distribution curves almost overlap and are indicative of the same tempering technology. In F type pottery, the frequency maximums are 1.31%/mm and 1.1%/mm and the distribution curves are similar. Their position suggests that the paste-crushed plants ratio is smaller in F pottery at Vădastra and points to the fact that, in general, the clay source was richer in smectite than that from Crușovu.

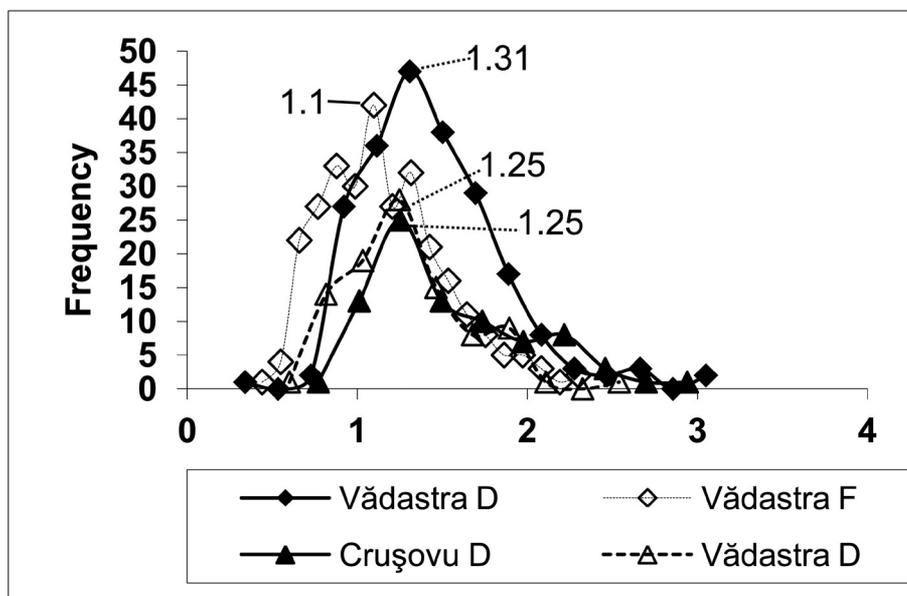


Fig. 8. Porosity index distribution of Vădastra and Crușovu D and F type sherds.

The plasticity index closely correlates with the sherds thickness (Fig. 9) in type D pottery at Crușovu ($n = 82$, $P_{pow} = 0.728^{***}$, $R_{lin} = 0.690^{***}$, $F = 60.82$) and Vădastra ($n = 215$, $R_{poly} = 0.728^{***}$, $R_{lin} = 0.674^{***}$, $F = 177.57$). Representative points are mixed up and distribute over a descending curve, with few of the points corresponding to type D pottery at Vădastra spread outside the compact points' area.

For the F type pottery from the two settlements, the distribution of representative points is even closer (Fig. 10), as shown by the porosity index-thickness ratio of the sherds from Crușovu ($n = 96$, $P_{exp} = 0.751^{***}$, $R_{lin} = 0.729^{***}$, $F = 106.91$) and Vădastra ($n = 290$, $R_{pow} = 0.659^{***}$, $R_{lin} = 0.800^{***}$, $F = 512.66$). Still, the thickness of the areas with compact points is relatively reduced and proves the successful adapting of the potters in Vădastra tradition to the use of local clay sources to the paste

for vessels modelling. These very close correlations show that the potters in the two settlements practiced the same technology for paste making and used a paste-crushed plants ratio which they tried to maintain within as close as possible boundaries, given the plastic properties of the clay sources.

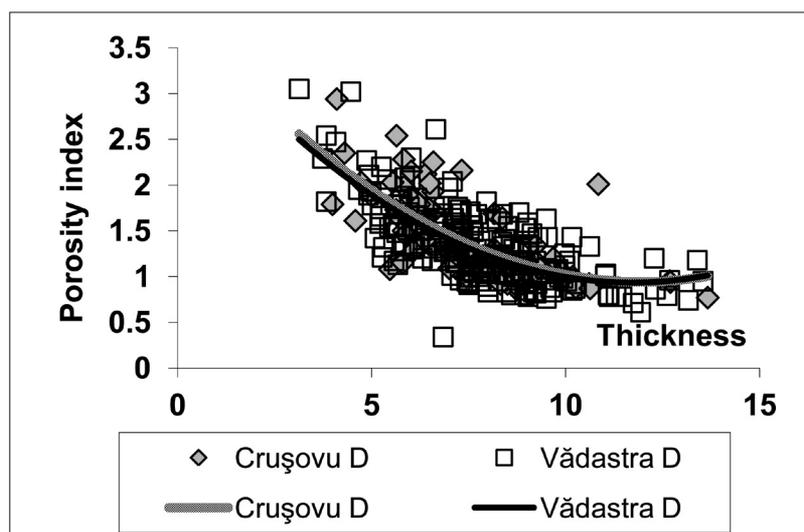


Fig. 9. Plasticity index and thickness ratio of Vădastra and Crușovu D and F type sherds.

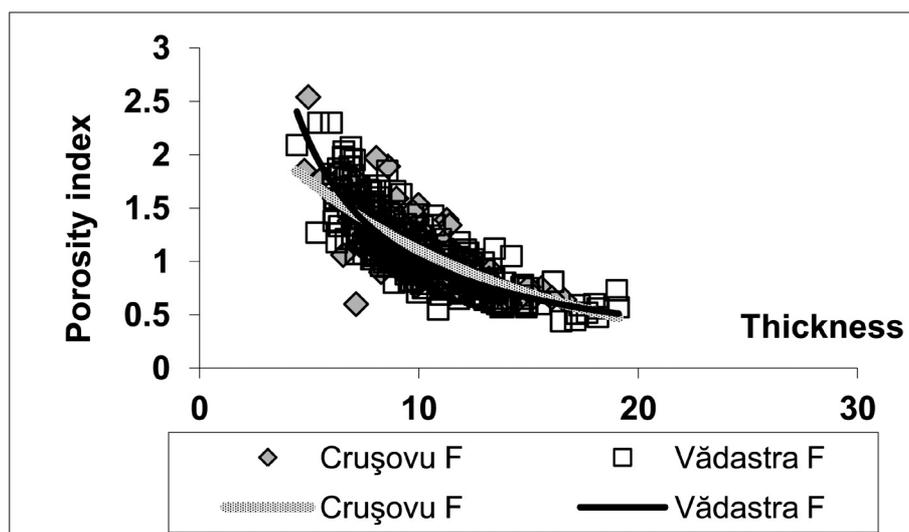


Fig. 10. Porosity index and thickness ratio of Vădastra and Crușovu D and F type sherds.

Modelling

In Vădastra tradition, vessels were modelled according to the coiling technique. Some recipients, like the pedestalled vessels, were modelled from two parts, while others, like the large elaborately ornamented storage vessels, seem to have been made

from three segments; smaller vessels, like for instance miniature pots, were made from a single clay piece¹⁸.

In the two settlements, vessels that belong to the analysed pottery categories were modelled into different shapes and sizes. From experience and tradition, the Neolithic potters maintained the same vessel types of different sizes and same proportions between size and walls thickness. Variation between walls thickness and their diameter was determined by the vessels shape (conical shaped, truncated shaped etc.), their plastic elements (vertical rims, everted, differences between the upper and lower parts of truncated shaped vessels etc.), the incisions and excisions, and the set up of surfaces for applying decorative white or ochre. In D type vessels from the two settlements, the thickness-diameter ratio (Fig. 11) is closer in the pottery from Vădastra ($n = 215$, $R_{exp} = 0.544^{***}$, $R_{lin} = 0.539^{***}$, $F = 87.3$) than in that from Crușovu ($n = 82$, $R_{poly} = 0.291^{**}$, $R_{lin} = 0.020$, $F = 0.03$). Representative points of the pottery in the two settlements are mixed up, their areas are almost overlapping and statistical curves follow the same trajectory in diameters over 150 mm. The pots' walls thickness of this type from the two settlements is below 15 mm, while diameters are below 400 mm.

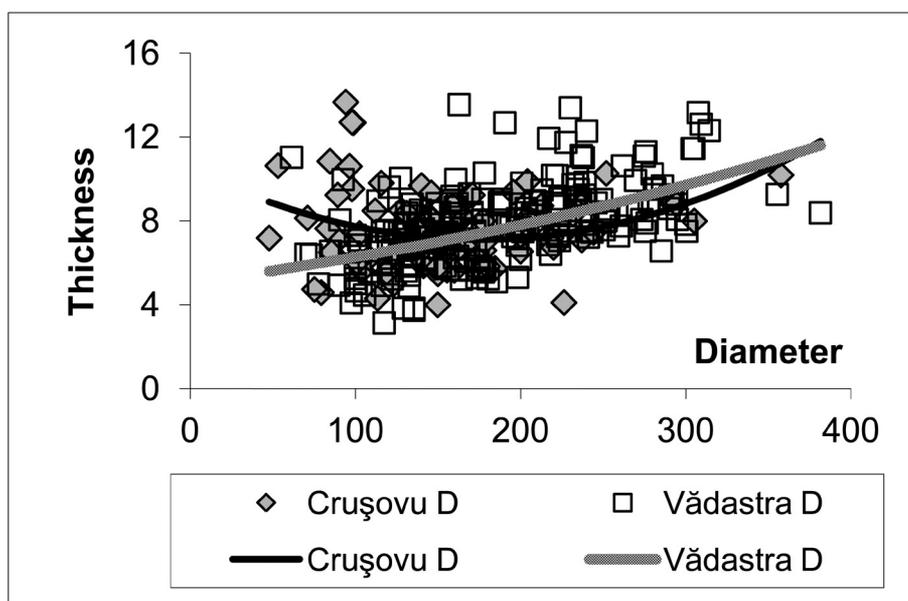


Fig. 11. Thickness and diameter ratio of Vădastra and Crușovu D type sherds.

In the F type pottery at Crușovu ($n = 96$, $R_{exp} = 0.346^{***}$, $R_{lin} = 0.314^{**}$, $F = 10.29$) and Vădastra ($n = 290$, $R_{poly} = 0.346^{***}$, $R_{lin} = 0.220^{***}$, $F = 14.68$) thickness-diameter ratios are close (Fig. 12) and close statistical curves overlap at values over 280 mm. The representative points are mixed up and the Vădastra pottery area appears slightly bigger than the F type pottery area at Crușovu. Vessels of this type are larger than those in type D, their diameters being over 600 mm and their thickness being up to 20 mm.

¹⁸ Dragoman 2010, 49-50.

The distribution of the chart points (Fig. 11-12) and their statistically significant correlations show that analysed pottery from the two settlements was mostly comparable in sizes and thickness for both D and F type vessels, with probably a bigger number of large-size vessels in the settlement at Vădastra.

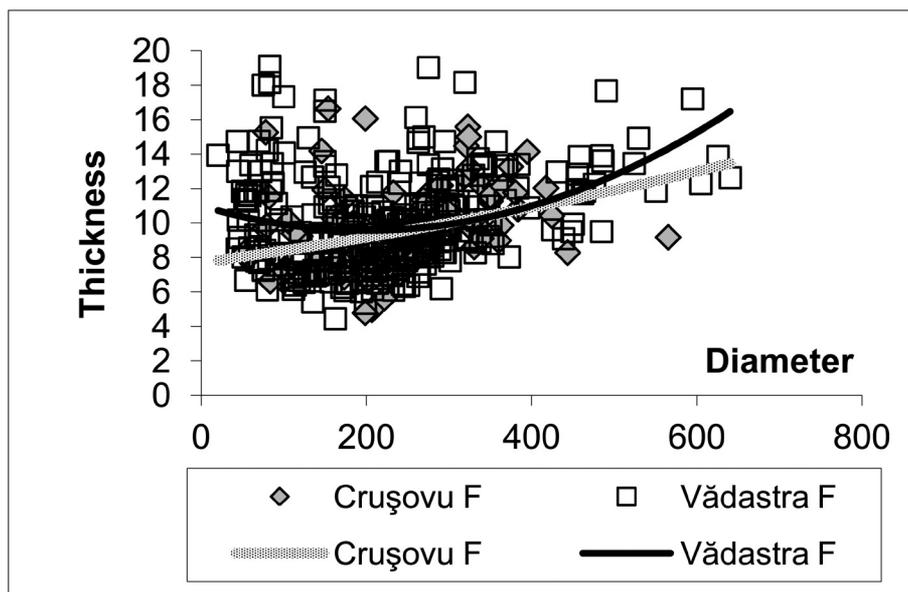


Fig. 12. Thickness and diameter ratio of Vădastra and Crușovu F type sherds.

Surface treatment

Drying the vessels subsequent to modelling was made at outdoor temperatures and in shadow. Dried vessels were covered with a barbotine obtained from the same clay as the paste. To the clay was gradually added a large water amount, being thoroughly shaken and the coarse part left to settle. Alternately, some archaeologists suggest that barbotine was made by potters' hands washing after modelling. This barbotine was used to cover vessel walls later burnished with pebbles, usually fine granulation quartz. Sherds were also used in vessels burnishing¹⁹. As traces on the sherds show, burnishing was most likely repeated several times. When lastly wetted, F type vessel walls were incised or excised, limy concretions were added and certain portions were covered with ochre. White paste and ochre were applied by some sort of brushes, some of the sherds preserving traces of such tools²⁰. A pottery fragment with incised decoration from Vădastra²¹ and a quartz stone from Crușovu²² were also used for applying ochre. Among other, bone tools²³ were used for the incised/excised decoration.

¹⁹ Dragoman 2010, 53 and Fig. 3.12/3.

²⁰ Găță, Mateescu 1992b, 241-242; Găță, Mateescu 1999-2001, 193.

²¹ Dragoman 2010, 54, Fig. 3.12/4.

²² Mateescu 1957, 106-107, Fig. 5.

²³ Mateescu 1957, 106-107, Fig. 6.

Firing

Subsequent the complete drying, vessels were fired in covered pits in a reducing atmosphere that would deposit onto their walls dark carbon compounds. In the settlement at Vădastra were discovered several round or oval “pot firing pits”, with maximum diameters between 0.56 m and 1.00 m²⁴. No such Neolithic pots firing installation was found at Crușovu.

The variation of dark hues and the occasional presence of grey and dark brown staining are evidence that air tight insulation was rather poor. Additionally, dark hues vary pronounced on inner and outer surfaces of the fired vessels. Quantifying the darkening degree and its representation on inner sides according to the value on outer surfaces (Fig. 13) in D type pottery at Crușovu and Vădastra show that representative points are mixed up and well spread on the chart, but their areas overlap. Statistic curves for D type pottery at Crușovu ($n = 72$, $R_{pow} = 0.652^{***}$, $R_{lin} = 0.647^{***}$, $F = 46.94$) and Vădastra ($n = 102$, $R_{pow} = 0.723^{****}$, $R_{lin} = 0.708^{***}$, $F = 147.7$) almost overlap and are evidence of the same firing system, with uneven temperature firing spaces, like those in firing pits. Usually, outer and inner sides exhibit different darkening degrees depending on the vessel position in the uneven temperature firing space.

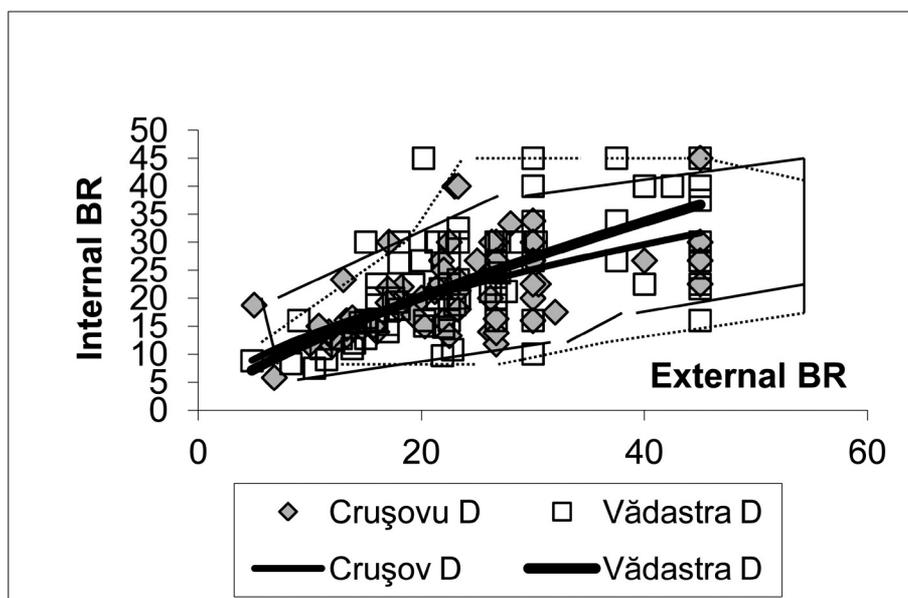


Fig. 13. Darkening degree of outer and inner surfaces of Vădastra and Crușovu D type sherds.

The F type vessels in the two settlements were fired in similar firing pits, in reducing atmosphere and have similar darkening degrees with the D type pottery. For the larger vessels, maintaining a reducing firing space was difficult, probably due to the uneven firing conditions and the necessity to avoid deposition of thick, difficult to remove carbon layers on the decorated portions.

²⁴ See Dragoman 2010, 55-57.

Firing temperatures were in most cases between 400° C and 550° C, since micaceous mineral was preserved undecomposed on the sherd surfaces from both settlements, while kaolinite is present in over 70% of the samples. This firing interval is also confirmed by rehydration of the clay minerals in the ceramic mass over the several millennia burial of the Vădastra sherds. Since pots were incompletely fired, and probably, over a limited time, the wall core temperature did not exceed 200°C-250°C in many cases.

After firing and gradual cooling in the firing space, the D type vessels were burnished again. In F type pots only the non-decorated parts were burnished and, with the aid of small polishing pebbles, the burnish on the ochre covered parts was emphasized. Very rarely, the surfaces were remedied with raw ochre, possibly because its poor adherence to fired ochre.

Mechanical resistance of the pots

The pottery in Vădastra tradition has a relatively poor resistance to shock and the sherds buried in the archaeological layer are in general of relatively small sizes. At a first estimate, their weight might be considered as measure to their mechanical resistance. The distribution of D and F type pottery fragments from the two settlements is always marked unimodal and right asymmetric (Fig. 14). Types D and F at Crușovu have 24.9 g and respectively 45.7 g maximums, while those at Vădastra - 34 g and 37.4 g, respectively. These close values confirm that the entire burnished Neolithic pottery in the two settlements has approximately identical mechanical resistance properties and comes from the same pottery technology, differences resulting from the experience and skillfulness of each potter and the tradition in each settlement.

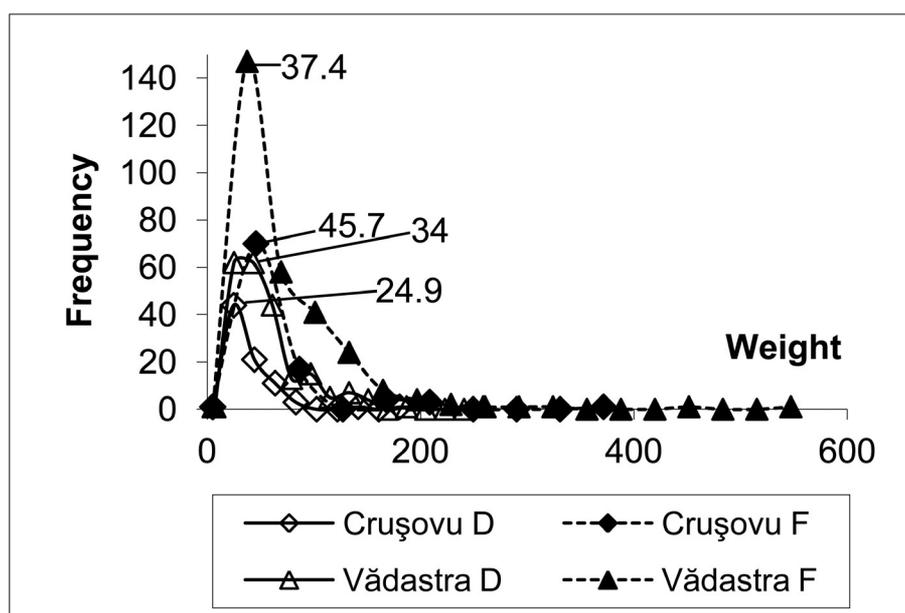


Fig. 14. Weight distribution of Vădastra and Crușovu D and F type sherds.

If the sherds weight and size would be proportional to the mechanic resistance, then weight should be related to the thickness of pot walls. In D type pottery from both settlements (Fig. 15), representative points are mixed up, yet those at Vădastra spread over an area that encompasses Crușovu points. The density of representative points is high in sherds below 70 g and much lower in the rest of the chart, where sherds from Vădastra settlement predominate. Statistic curves from Crușovu ($n = 82$, $R_{pow} = 0.402^{***}$, $R_{lin} = 0.245^*$, $F = 5.1$) and Vădastra ($n = 215$, $R_{log} = 0.480^{***}$, $R_{lin} = 0.420^{***}$, $F = 45.62$) are overlapping and confirm the same mechanical resistance of the sherds from the two settlements and the same pottery technology.

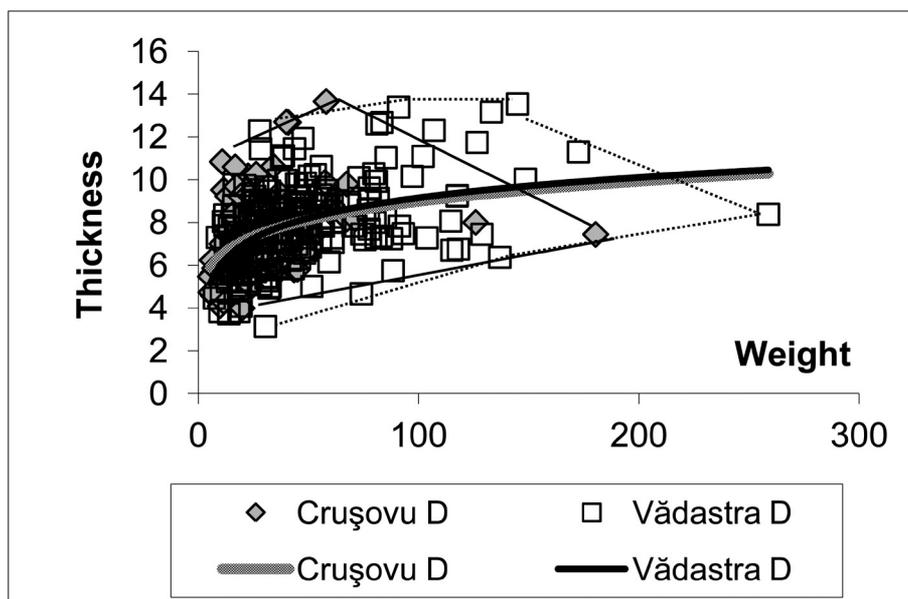


Fig. 15. Thickness and weight ratio of Vădastra and Crușovu D type sherds.

In type F pottery, the chart (Fig. 16) is in general similar to that preceding. Representative points at Crușovu ($n = 96$, $R_{pow} = 0.379^{***}$, $R_{lin} = 0.341^{***}$, $F = 12.34$) are mixed with those at Vădastra ($n = 290$, $R_{pow} = 0.521^{***}$, $R_{lin} = 0.422^{***}$, $F = 62.51$) and the F type pottery area at Crușovu is included in the F type pottery area at Vădastra. This chart also comprises of two areas with different densities of points, the compact area comprising almost entirely points corresponding to F type pottery from Crușovu. Representative curves of the pottery in the two settlements follow the same trajectories and slightly distance one from another for large sherd weights. The resemblance of the last two charts is indicative of the same properties of D and F pottery from the two settlements, which accounts for identical fabric and firing technologies.

Conclusions

The comparison between type D and F black burnished pottery in the Neolithic settlements at Vădastra and Crușovu showed that the same pottery technology was used at both sites, from local clay sources of clayish sand-sandy clay textures and

two-fold successive tempering, namely, that of the paste and paste tempered with crushed plants, respectively.

The modelling of the vessels was carried out by the coiling technique, in compliance with traditional shapes and decorations.

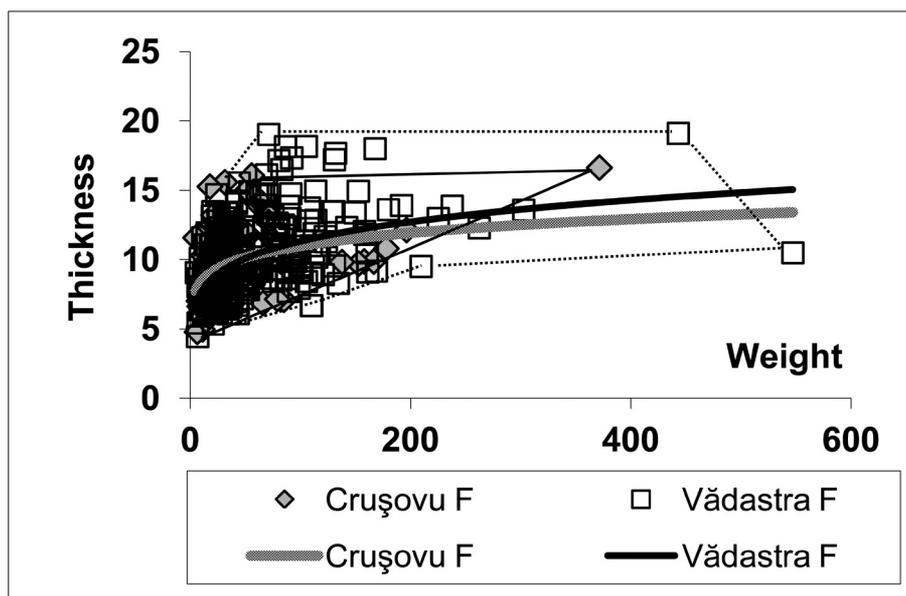


Fig. 16. Thickness and weight ratio of Vădastra and Cruşovu F type sherds.

After having been dried at outdoor temperature, vessels were covered with a diluted barbotine made from the same paste and were burnished using (also) polishing pebbles. Such burnishing was likely carried out several times. The D type vessels were ornamented with channellings, and those of F type, with incisions and excisions. In the F type pottery, incised/excised decoration was ornamented with white paste, while undecorated portions and pot rims were painted with ochre.

Firing in covered pits, in an intentionally reducing atmosphere and uneven firing space was in general carried out at temperatures between 400°C and 550°C, as shown by the kaolinite and micaceous minerals present on the sherds surface. Owing to the uneven firing space, the outer, core and inner sides of the vessels evidence frequently different firing temperatures.

Analytic data proved there is no technological difference between Vădastra and Cruşovu potteries, yet the F type pottery in the two settlements seems to be of better quality than the D type pottery, this accounts either for a technological improvement (which could be assigned to a time succession of the two pottery types use), or a special attention (i.e. a more careful tempering of the paste due to deeper excisions, which could result in firing problems and/or special importance).

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Information on illustrated pots

Fig. 2/1. Vădastra; pot published for the first time as drawing in Mateescu 1965, Tav. XLIII/2; storage location: National Museum of Romanian History, Bucharest (MNIR); inv. no. 15857.

Fig. 2/2. Vădastra 1946; pot published for the first time as drawing in Mateescu 1961, 532, Fig. 2; storage location: MNIR; inv. no. 15859.

Fig. 2/3. Crușovu 1955; pot published for the first time as drawing in Mateescu 1957, 105, Fig. 2/2; storage location: “Vasile Pârvan” Institute of Archaeology of the Romania Academy, Bucharest; inv. no. III 7133 .

Fig. 2/4. Crușovu 1955; lid published for the first time as drawing in Mateescu 1957, 109, Fig. 8 and photo in Dumitrescu 1968, Fig. 11; storage location: MNIR, inv. no. 15856.

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