PLANT HUSBANDRY AND VEGETATION OF TELL GOMOLAVA, VOJVODINA, YUGOSLAVIA

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ABSTRACT: This paper describes the results of the archaeobotanical examination of Neolithic, Eneolithic and Iron Age occupation levels of Tell Gomolava, Yugoslavia. The original vegetation of the Gomolava area was mixed deciduous forest, and riverine forest in the valley of the nearby Sava river. Through all periods, wheat, barley and lentil were staple crops, while broomcorn millet (*Panicum miliaceum*) had considerably gained in importance in Iron Age levels. Other cereal and pulse crops, such as oats, rye, pea and broad bean (*Vicia faba* var. *minor*), played a much more modest part. Flax (linseed) is only scarcely represented. Mention should be made of the prominent role of einkorn wheat (*Triticum monococcum*). Wild fruits, among which Cornelian cherry (*Cornus mas*) and the berries of Chinese lantern (*Physalis alkekengi*), were collected in woods and wood clearings. Wild-fruit gathering had greatly declined in Iron Age times, which may point to the disappearance of forest from the area. The flora of arable fields and waste places is well represented.

KEYWORDS: cereal and pulse-crop cultivation, river-valley and upland forest, wild-fruit gathering, weed vegetation.

1. INTRODUCTION

1.1. The site

In the present report the results are discussed of the study of seeds, fruits and wood charcoal preserved in occupation deposits of the prehistoric and early-historical settlement of Gomolava. The dwelling mound of Gomolava, on the southern edge of the Central European Plain, is located on the left bank of the river Sava, near the town of Hrtkovci, c. 55 km west of Belgrade (fig. 1). The settlement was probably founded at some distance from the Sava, which in the past flowed several kilometres west of its present position (cf. Borojević, 1988b). In the course of time the river has shifted its bed in an eastward direction and has, as a result, eroded a substantial part of the mound. Originally, the site must have measured about 230 by 80 metres, but in the nineteen-seventies its greatest width had been reduced to about 45 metres. The mound, which rises more than five metres above the surrounding land surface, consists of an eastern and a western part, separated by a depression (fig. 2). The continuing erosion of the site by the river has in no small measure contributed to the decision to excavate the tell. Systematic excavations, on behalf of the Vojvodjanski Muzej at Novi Sad, started in 1953 (cf. Girić, 1988). After an interruption of eight years, excavations were continued through 1965–1985 under the direction of Professor Bogdan Brukner (Institut za Izučavanje Istorije Vojvodine, Novi Sad), Dr. Borislav Jovanović (Arheološki Institut, Belgrade) and Dr. Nikola Tasić (Balkanološki Institut Srpske Akademije Nauk, Belgrade). Information on the stratigraphy and chronology of the site, as far as of relevance to the present study, is presented in papers by Brukner (1965, 1971, 1988), Jovanović (1971, 1988), Petrović (1988) and Tasić (1988).

Gomolava is a multi-period mound, in which eight main periods of occupation are distinguished. With respect to the dating of the occupation phases from which the plant remains discussed in the present paper were retrieved, the following should be mentioned. Twenty-eight radiocarbon dates obtained from the site have been published and discussed by Waterbolk (1988). Besides, there are the dates of the absolute chronology accepted for prehistoric Southeast Europe (information provided by Mr. J.N. Lanting). The earliest occupation at Gomolava is attributed to the Vinča-Tordos/Vinča-Pločnik transitional phase. Vinča-Pločnik C deposits, which are sealed off by a Vinča-Pločnik C/D horizon, reach a thickness of about two metres. Rows of post-holes, which came to light in the subsoil underneath the tell, indicate that the Vinča-Pločnik houses were up to 7 m wide and more than 16 m long. In the occupation deposits remains of house floors of burnt clay were frequently found. Waterbolk (1988) dates the Vinča occupation at Gomolava from 4900 to 4600 BC (in calibrated radiocarbon years). Allowing for the statistical uncertainty of the measurements and uncertainties in the calibration of the radiocarbon dates concerned, the duration of the Vinča occupation can, according to Waterbolk, be estimated at 200 to 400 years.

Among the Eneolithic cultures established for Gomolava, the Kostolac culture is by far best represented; several building phases could be distinguish-

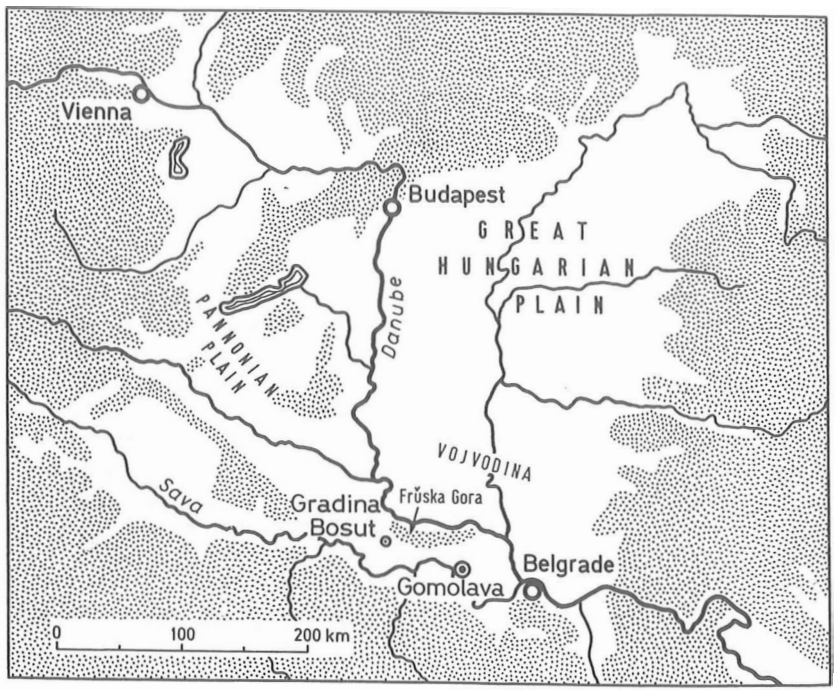


Fig. 1. Location of Gomolava on the southern edge of the Central-European Plain, which includes the Pannonian Plain, the Great Hungarian Plain and Vojvodina. Stippled areas are over 200 m above sea-level.

ed in Kostolac deposits of appreciable thickness. The Kostolac culture of Southeast Europe is dated to c. 3350–2900 BC. Three Kostolac samples from Gomolava date to around 3000 BC. No botanical samples are available from Bronze Age levels, which were rather poorly preserved. A small number of samples were secured from Late Bronze/Early Hallstatt (Bronze D/Hallstatt A) levels dated to 1300–1200 BC. Fairly thick culture deposits testify to Iron Age occupation: Hallstatt C and D (800–500 BC) and La Tène (500–0 BC). After the La Tène period, in the early centuries AD, Gomolava continued to be inhabited, now as a Roman provincial settlement. There is no archaeobotanical information on the medieval occupation of the site.

1.2. The environment

In the Gomolava area, the river Sava constitutes the border between a loess region on the left (Gomolava) side of the river and a region with sand and clay deposits on the opposite side (cf. Eggink, 1983: fig. 7). On the loess deposits predominantly chernozem soils have developed (cf. Borojević, 1988b: fig. 3). Nowadays almost the whole of the area is under cultivation, but it must originally have been covered by mixed deciduous forest, such as at present is still found in the hilly region of the Fruška Gora (fig. 1), be it in a somewhat impoverished state. Of the tree taxa observed by the present author in the Fruška Gora are mentioned here: oak (*Quercus*), beech (*Fagus*), hornbeam (*Carpinus*), linden (*Tilia*), elm (*Ulmus*) and maple (*Acer*). In old riverbeds and cut-off meanders marsh vegetation and subsequently swamp forest could develop. Rather seriously affected riverine (river-valley) forest near the site consisted of poplar (*Populus*), willow (*Salix*), elm (*Ulmus*), ash (*Fraxinus*) and the climbers grape vine (*Vitis vinifera* subsp. *sylvestris*) and hop (*Humulus lupulus*) in the upper storey. The vegetation of the lower storey included alder buckthorn (*Frangula almus*), dogwood (*Cornus sanguinea*), blackthorn (*Prunus spinosa*), spindle tree (*Euonymus europaeus*), bittersweet (*Solanum dulcamara*), dewberry (*Rubus caesius*), and false indigo (*Amorpha fruticosa*) and prickly cucumber (*Echinocystis lobata*), both introduced from North America.

Needless to say, the loess soils are eminently suited for agriculture and for that reason they must have been very attractive to prehistoric farmers.

1.3. The samples

Through 1967–1971 and in 1978 samples of charred seeds and wood charcoal were taken by the excavators when carbonised plant remains were observed

Table 1. Samples from Vinča-Pločnik (VP), Kostolac (K), Hallstatt (H), La Tène (LT) and Roman-period (R) levels examined for seeds and fruits and included in the present paper. Unless otherwise stated, the samples have been examined entirely.

No.	Square	Level	Particulars	No.	Square	Level	Particulars
VP1	70,71/XVI,XVII	?		H1	71,72/XII–XIV	8	pit
VP2	70,71/XVI,XVII	?	3/7 examined	H2	82,83/XIX	12	1/4 examined
VP3	71/XIV	17		H3	83,84/XI	14	
VP4	72/XIII,XIV	15		H4	84/XX	12	1/5 examined
VP5	72,73/VIII,IX	19	pit	H5	92,93/XII, XIII	15	
VP6	72,73/VIII,IX	19		H6	94/XIV	15	
VP7	72,73/IX	20	pit	H7	96/XIV	16	pit: Bronze D/ Hallstatt A
VP8	73,74/XI	19					
VP9	74,75/X,XI	20					
VP10	74,75/XI,XII	21		LT1	67/XVI	10	
VP11	74,75/XI,XII	20		LT2	70/XVI	9–10	
VP12	74,75/XI,XII	20	pit	LT3	72/XIII	7	
VP13	75/76/XI	15		LT4	76/XVII,XVIII	8	
VP14	76/XI,XII	16		LT5	77/XVI,XVII	8	
VP15	76,77/XIII	20		LT6	78/XVI	12	
VP16	76,77/XI,XII	20	pit	LT7	78,79/XV,XVI	8	
VP17	77,78/XII,XIII	17		LT8	79/XVI,XVII	8	
VP18	77,78/XII,XIII	17		LT9	80,81/XIII	9	
VP19	77,78/XII,XIII	18		LT10	80,81/XV,XVI	8	
VP20	77,78/XIII,XIV	20	pit	LT11	81,82/XV	?	
VP21	78,79/XIII,XIV	20		LT12	82/XVI	14	
VP22	78,79/XIII,XIV	20	1/5 examined	LT13	82/XVI,XVII	11	
VP23	78,79/XIII,XIV	20	pit	LT14	82,83/XI	11	
VP24	78,79/XIV	24		LT15	82,83/XVII,XVIII	11	
VP25	79,80/XII	15		LT16	82,83/XIX	11	
VP26	81/XII	18		LT17	83/X	11	
VP27	83,84/XI,XII	17		LT18	83/XVI	8	
VP28	84/XI	16		LT19	83/XVII,XVIII	8	
VP29	84,85/IX	17		LT20	83,84/VIII	10	
VP30	86,87/XIII,XIV	23		LT21	85/XII	9	
VP31	89,90/IX,X	21		LT22	85,86/?	?	pit
VP32	91,92/XIII,XIV	22		LT23	86/XVI	8	
VP33	93,94/X,XI	22		LT24	87/XV,XVI	11	
VP34	94/XIII,XIV	23		LT25	90,91/XIX,XX	8	
VP35	94/XIV	24		LT26	91/XIX	10	
VP36	94,95/XIV	23		LT27	91,92/XVIII	7	
VP37	97,98/XI,XII	22		LT28	94,95/XVIII,XIX	8	
VP38	97,98/XII	21		LT29	101/XII	9	
VP39	98/XIV	22					
VP40	102/XI,XII	24	pit	R1	B1	8	1/9 examined
VP41	103,104/XIII,XIV	21		R2	D4	6	1/2 examined
K1	69/XVIII,XIX	?					
K2	70/XV,XVI	?					
K3	70/XVI,XVII	11					
K4	72/XIX	12					
K5	73/XVIII	12	remains of basket				
K6	73,74/XV,XVI	12					
K7	75,76/XV	?					
K8	77/XVIII	13					
K9	80/XVI	14	pit				
K10	100,101/XVI	13					

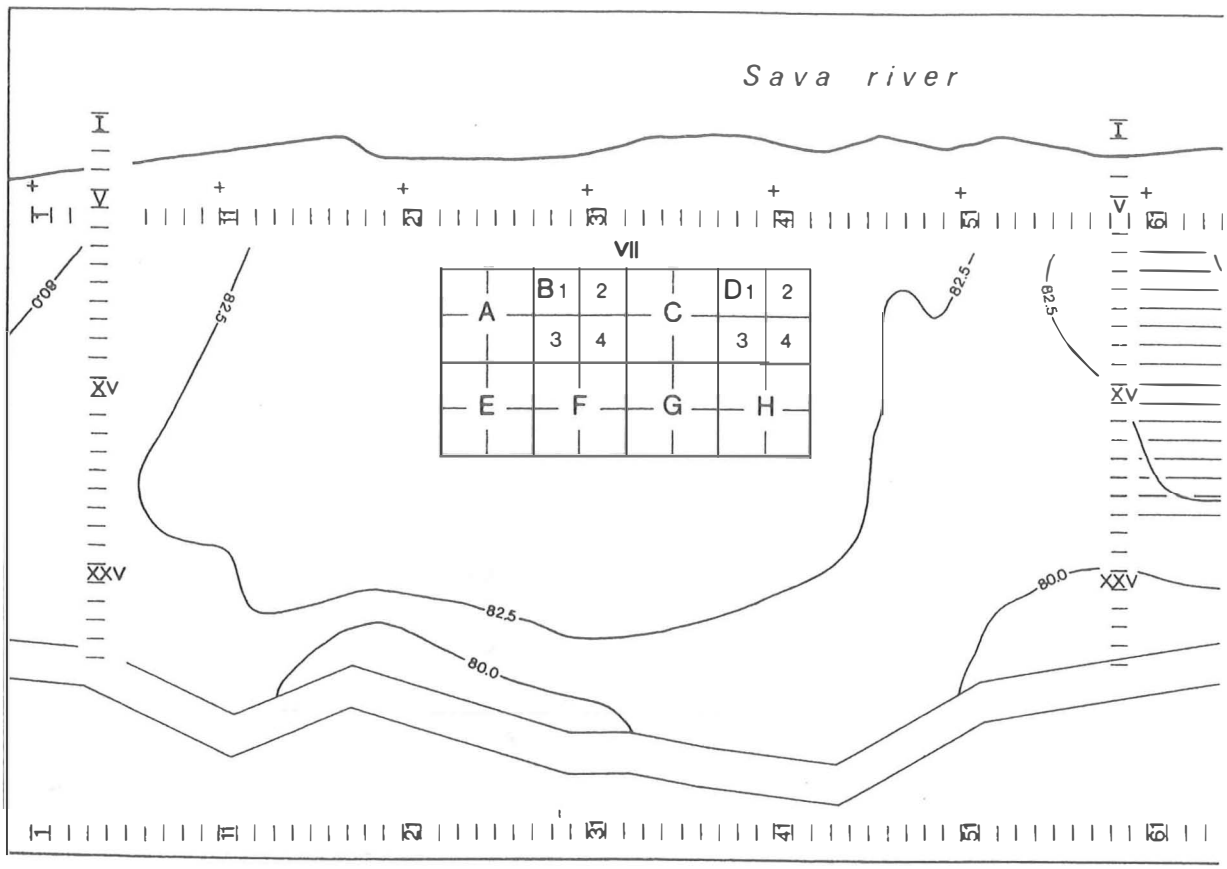
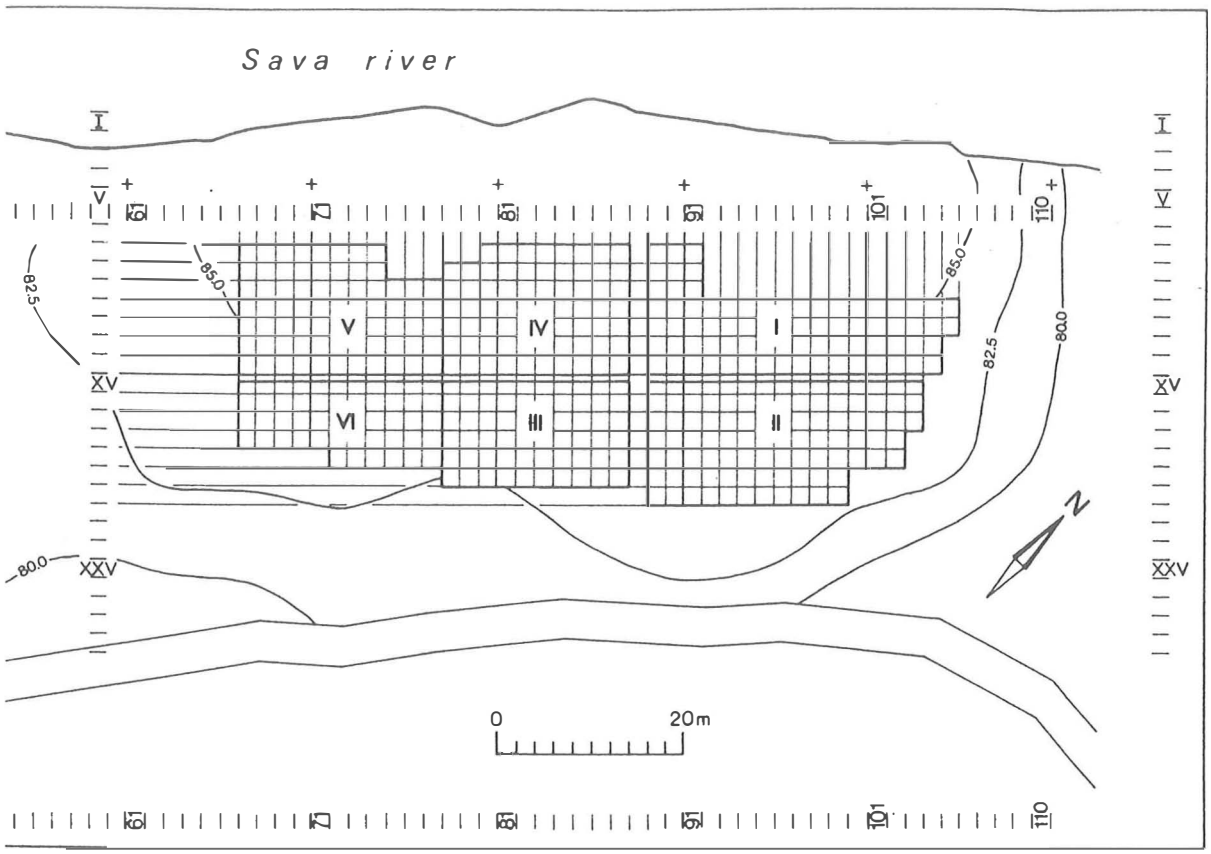


Fig. 2. Left and right page. Topographic map of Gomolava with grid system and excavation areas I–VII.

in some quantities, e.g. charred seeds in the fill of a storage pit. During the excavation seasons 1972–1977 the site was sampled for plant remains by W. van Zeist, S. Bottema and H. Woldring (in chronological order). In this case not only spots where charred remains were visible with the naked eye were sampled, but also samples were secured from features that looked promising because of the dark coloration (ashy appearance) of the soil. In the field, charred plant remains were recovered from the soil samples by means of a simple manual water separation method. The volumes of the samples floated, up to 50 litres, varied considerably, but no records have been kept of the individual samples. For that reason, numbers of seeds etc. recovered cannot be expressed per unit volume of soil. In this connection it should be kept in mind that the present study was primarily aimed at obtaining information on the plant husbandry of the inhabitants of the site and changes therein in the course of time. During fieldwork emphasis was laid on a satisfactory archaeobotanical coverage of the various periods represented at Gomolava.

In the framework of the present study almost one hundred samples were examined for seeds and fruits. Samples which yielded only a few, poorly preserved seeds or which are of uncertain date are left out of consideration. The seed samples included in the report are listed in table 1, while the results of the analyses are presented in tables 2–4. Almost all these samples are from areas I to VI, on the eastern half of the mound (fig. 2). The square designations in table 1, such as 70,71/XVI,XVII, refer to the 2×2 m grid laid out over the tell. Only two samples (R1 and R2) are from the western half of the site (area VII) which was excavated from 1977 onwards (fig. 2). The majority of the Vinča-Pločnik (VP) samples are attributed to the Vinča-Pločnik C period, but a few are from Vinča-Pločnik C/D levels. Sample H7, listed under Hallstatt, is from a Bronze D/Hallstatt A context.

Many of the samples are from what may be called deposits of occupational soil. In these deposits, plant remains of diverse origins are usually found together. Also at Gomolava, in samples of occupational soil cereal chaff remains (spikelet forks, glume bases) may be much more numerous than the grains, indicating that waste of crop processing had been deposited there. On the other hand, several samples presented in tables 2–4 consist of the remains of more or less pure cereal crop supplies.



In addition to the carbonised plant remains, uncharred seeds were recovered. Some of them were clearly modern intrusions, carried downwards by burrowing animals, but some others, with sturdy seed coats, did not look quite so 'new'. They had certainly been preserved in the soil for quite some time, but it is debatable whether they are of the same age as the levels from which they are retrieved, as is assumed for the charred seeds, or whether they are of a considerably more recent date. Could they have been the result of earlier intrusions? Because of their uncertain origin, non-carbonised seeds have been left out of consideration in the present study, but not everybody will agree with that (see Section 2: *Sambucus*).

Wood charcoal samples secured in 1967–1972 were examined by Mrs. J.A.H. Bakker-Heeres. The results of the wood identifications, which are summarised in table 7, will come up for discussion in Section 4.1.

A great number of samples from a 2×2 m column excavated on the western half of the tell (see Section 1.4) were examined by S. Bottema (Bottema & Ottaway, 1982). Here the sample volumes were all about 12 litres. This particular study will not be amply discussed in the present report, but where appropriate reference will be made to the results.

1.4. Previous reports

A few papers on the palaeobotany of Gomolava have appeared previously. A preliminary report on cultivated plants identified from the site has been published by W. van Zeist (1975). The illustrations of crop-plant seeds shown in the present paper (figs 3 and 4) are taken from that report. A palynological examination of samples from the exposed section facing the Sava river was executed by S. Bottema (1975: table 7). Some of the results are presented also in the form of a pollen diagram (Bottema & Ottaway, 1982: fig. 6).

In 1977, in the western part of the tell a 2×2 m sondage was excavated by Barbara S. Ottaway and systematically sampled for seeds, wood charcoal, bones, snails, pottery, flints and other archaeological objects (Bottema & Ottaway, 1982). Nineteen levels of c. 30 cm each were distinguished. The main results of the seed analysis carried out by S. Bottema

Table 2. Numbers of seeds etc. in samples from Vinča-Pločnik (VP) levels. For information on the samples (square, level), see table 1. Cereal grain fragments are in grams.

	Sample number									
	VP1	VP2	VP3	VP4	VP5	VP6	VP7	VP8	VP9	VP10
Triticum monococcum	39	450	1030	2015	5	17	19	2	7	4
Triticum dicoccum	10	39	27	125	7	22	1	-	6	2
Tr. mon./dic., spikelet forks	57	1	-	10	40	358	318	51	18	4
Tr. mon./dic., glume bases	86	1	-	-	9	132	210	26	2	1
Triticum aestivum	-	-	10	-	4	19	11	1	22	5
Hordeum vulgare	-	-	-	-	-	1	-	-	2	2
Hordeum, rachis internodes	-	-	-	-	-	-	-	-	-	-
Avena (fatua)	-	-	1	-	-	-	-	-	-	-
Cereal grain fragments	0.31	1.16	3.86	28.35	1.30	0.36	0.40	0.01	0.98	0.05
Panicum miliaceum	-	-	4	2	-	1	-	-	1	-
Lens culinaris	2	1	-	-	-	-	3	1	39	-
Pisum sativum	-	1	-	-	-	-	-	-	-	-
Linum usitatissimum	-	-	-	-	1	-	-	-	9	-
Fragaria vesca	-	-	-	-	-	-	-	-	-	-
Physalis alkekengi	2	4	2	10	-	1	-	1	165	1
Cornus mas	-	-	-	1	-	-	1	-	-	-
Malus sylvestris, pips	-	-	-	-	-	-	-	-	-	-
Rubus fruticosus	-	1	-	3	-	-	-	-	-	-
Sambucus nigra	-	2	-	-	-	-	-	-	-	-
Vitis vinifera	-	-	-	-	-	-	-	-	-	-
Agrostemma githago	-	-	-	-	-	-	-	-	-	-
Ajuga chamaepitys (type)	-	-	-	-	-	-	-	-	-	-
Atropa belladonna	-	-	-	-	-	-	-	-	-	-
Bromus arvensis (type)	-	-	-	-	-	-	-	-	-	-
Carex	-	-	-	-	-	-	-	-	-	-
Chenopodium album	3	-	-	-	-	-	-	1	17	-
Chenopodium hybridum	-	-	-	-	-	-	-	-	-	-
Chenopodium polyspermum	-	-	-	-	-	-	-	-	-	-
Chenopodium sp.	-	-	-	-	-	-	-	-	-	-
Euphorbia helioscopia	-	-	-	-	-	-	-	-	-	-
Galium spurium (type)	-	-	-	-	-	-	-	-	-	-
Unident. Gramineae	-	-	-	-	-	-	-	-	-	-
Plantago lanceolata (type)	-	-	-	-	-	-	-	-	-	-
Polygonum convolvulus	-	1	-	2	-	-	1	-	4	-
Rumex sp.	-	-	-	-	-	-	-	-	-	-
Sambucus ebulus	1	2	-	4	2	21	2	-	-	-
Weedy *Secale*	-	-	-	-	-	-	-	-	-	-
Silene	-	-	-	-	-	-	-	-	-	-
Solanum nigrum	-	-	-	-	-	-	-	-	-	-
Teucrium chamaedrys/scordium	-	-	-	-	-	-	-	-	-	-
Trapa natans, spines	-	-	-	-	-	-	-	-	-	-
Vicia sp.	1	-	-	-	-	1	-	-	2	-
Unidentified	4	2	2	-	-	1	-	-	14	-

are presented in a so-called agrobotanical diagram, in which the average numbers of seeds per ten litres of soil are shown (Bottema & Ottaway, 1982: fig. 5). Four hand-picked charred seed samples from La Tène levels are discussed in a paper by K. Borojević (1988a). The same author has made a comparison between the plant remains from Neolithic Gomolava and Neolithic Opovo (Borojević, 1988b).

It is the main objective of the present report to make the data available for future studies on plant cultivation and vegetation in prehistoric and early-historical south-eastern Europe. The author apologises for the considerable delay in getting the full results published.

Table 2 (continued).

	Sample number									
	VP11	VP12	VP13	VP14	VP15	VP16	VP17	VP20	VP21	VP22
Triticum monococcum	3	7	3	70	14	20	95	-	4	50
Triticum dicoccum	10	3	2	8	9	4	75	-	2	9
Tr. mon./dic., spikelet forks	12	31	-	485	132	345	-	98	61	154
Tr. mon./dic., glume bases	4	12	-	1525	169	111	-	34	43	706
Triticum aestivum	7	3	-	13	8	4	-	1	-	6
Hordeum vulgare	-	-	2	2	5	1	-	-	2	-
Hordeum, rachis internodes	-	2	-	-	-	-	-	-	-	-
Avena (fatua)	-	-	-	-	-	-	-	-	-	-
Cereal grain fragments	0.53	0.13	-	0.43	0.55	0.39	8.03	0.05	0.08	0.16
Panicum miliaceum	1	-	6	35	-	3	-	-	1	-
Lens culinaris	-	1	1	-	-	1	-	1	-	-
Pisum sativum	-	2	-	-	1	-	-	-	-	-
Linum usitatissimum	-	-	-	1	-	-	-	-	-	-
Fragaria vesca	-	-	-	-	-	-	-	-	-	-
Physalis alkekengi	-	-	-	1	1	9	-	-	-	3
Cornus mas	-	-	-	1	-	-	-	-	-	1
Malus sylvestris, pips	-	-	-	-	-	-	2	-	-	-
Rubus fruticosus	-	-	-	-	-	-	-	-	-	-
Sambucus nigra	-	-	-	-	-	-	-	-	-	-
Vitis vinifera	-	-	-	-	-	-	-	-	-	-
Agrostemma githago	-	-	-	-	-	-	-	-	-	-
Ajuga chamaepitys (type)	-	-	-	-	-	-	-	-	-	-
Atropa belladonna	-	1	-	-	-	-	-	-	-	-
Bromus arvensis (type)	-	-	-	-	-	-	-	-	-	-
Carex	-	-	-	-	-	-	-	-	-	-
Chenopodium album	-	-	-	1	-	8	-	1	1	89
Chenopodium hybridum	-	-	-	-	-	-	-	-	-	-
Chenopodium polyspermum	-	1	-	-	-	-	-	-	-	-
Chenopodium sp.	-	-	-	-	1	-	-	-	-	-
Euphorbia helioscopia	-	-	-	-	-	-	-	-	-	-
Galium spurium (type)	-	-	-	-	1	-	-	-	-	-
Unident. Gramineae	-	-	-	-	-	-	-	1	-	-
Plantago lanceolata (type)	-	-	-	-	-	-	-	-	-	-
Polygonum convolvulus	1	-	-	5	5	1	-	-	1	6
Rumex sp.	-	-	1	-	-	-	-	-	-	-
Sambucus ebulus	-	-	-	2	-	4	1	4	-	-
Weedy *Secale*	-	-	-	-	-	-	-	-	-	-
Silene	-	-	-	-	-	-	-	-	-	-
Solanum nigrum	-	-	-	-	-	-	-	-	-	-
Teucrium chamaedrys/scordium	-	-	-	-	-	-	-	-	-	-
Trapa natans, spines	-	-	-	-	2	10	-	-	-	-
Vicia sp.	1	-	-	2	1	-	-	-	-	-
Unidentified	-	-	-	-	-	2	-	-	-	1

1.5. Acknowledgements

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Table 2 (continued).

	Sample number									
	VP23	VP24	VP25	VP26	VP27	VP28	VP29	VP30	VP31	VP32
Triticum monococcum	-	1	9	10	40	3060	728	3	8	5
Triticum dicoccum	1	5	1	-	5	117	1320	7	2	3
Tr. mon./dic., spikelet forks	37	7	21	-	-	24	2	1	21	59
Tr. mon./dic., glume bases	13	3	13	-	-	12	-	2	4	26
Triticum aestivum	-	-	-	3	-	-	16	-	1	2
Hordeum vulgare	-	-	4	4	-	20	19	-	-	-
Hordeum, rachis internodes	-	-	3	-	-	-	-	-	-	-
Avena (fatua)	-	-	1	1	-	-	-	-	-	-
Cereal grain fragments	0.06	0.06	0.07	0.09	0.12	12.12	29.87	0.13	0.07	0.08
Panicum miliaceum	-	-	69	67	6	19	7	3	1	19
Lens culinaris	1	-	5	2	-	2	-	3	2	1
Pisum sativum	-	-	-	-	-	-	-	-	2	-
Linum usitatissimum	-	-	-	-	-	-	-	-	-	1
Fragaria vesca	-	-	-	-	-	-	-	-	-	-
Physalis alkekengi	2	-	-	-	-	-	-	14	1	1
Cornus mas	-	2	-	-	-	-	-	-	-	-
Malus sylvestris, pips	-	-	-	-	-	-	-	-	-	-
Rubus fruticosus	-	-	-	-	-	-	-	-	-	-
Sambucus nigra	-	-	-	-	-	-	-	-	-	-
Vitis vinifera	-	-	-	-	-	-	-	-	-	-
Agrostemma githago	-	-	-	-	1	1	-	-	-	-
Ajuga chamaepitys (type)	-	-	-	-	-	-	-	2	-	-
Atropa belladonna	-	-	-	-	-	-	-	-	-	-
Bromus arvensis (type)	-	-	-	-	-	13	-	-	-	-
Carex	-	-	-	-	-	-	-	-	-	-
Chenopodium album	3	-	1	-	1	-	-	2	1	-
Chenopodium hybridum	-	-	1	-	-	-	-	-	-	-
Chenopodium polyspermum	-	-	-	-	-	-	-	-	-	-
Chenopodium sp.	-	-	-	-	-	-	-	-	-	-
Euphorbia helioscopia	-	-	1	-	-	-	-	-	-	-
Galium spurium (type)	-	-	-	-	-	-	-	-	-	-
Unident. Gramineae	-	-	-	-	-	2	-	-	-	-
Plantago lanceolata (type)	-	-	-	1	-	-	-	-	-	-
Polygonum convolvulus	-	-	-	1	-	-	-	4	-	-
Rumex sp.	-	-	1	-	-	-	-	-	-	-
Sambucus ebulus	-	-	-	-	-	1	-	-	-	-
Weedy *Secale*	-	-	-	-	2	-	1	-	-	-
Silene	-	-	-	-	-	-	-	-	-	-
Solanum nigrum	-	-	-	-	-	-	-	-	-	-
Teucrium chamaedrys/scordium	-	-	-	-	-	-	-	-	-	-
Trapa natans, spines	-	-	-	-	-	-	-	-	-	-
Vicia sp.	-	-	-	-	-	-	-	-	-	-
Unidentified	-	-	1	-	1	2	-	1	-	-

The author wishes to express his sincere thanks to all who co-operated in the present study.

2. COMMENTS ON PLANT REMAINS

No detailed descriptions of seeds and fruits of wild and cultivated plants identified from Gomolava are presented. Virtually all seed and fruit types have already been described from other sites. Comments on morphological features of plant remains will be confined to those of particular relevance to the identification of the Gomolava material. In addition, some special attention will be paid to a few species characteristic of the Gomolava seed record.

Avena. The species identity of the *Avena* (oat) grains poses a problem because no satisfactory distinction can be made between those of wild oat (*A. fatua*) and cultivated common oat (*A. sativa*). No floret bases,

Table 2 (continued).

	Sample number								
	VP33	VP34	VP35	VP36	VP37	VP38	VP39	VP40	VP41
Triticum monococcum	1	10	7	4	6	2	3	9	3
Triticum dicoccum	-	1	2	2	2	3	2	1	4
Tr. mon./dic., spikelet forks	18	21	7	24	81	17	29	12	21
Tr. mon./dic., glume bases	8	3	1	8	49	1	12	4	9
Triticum aestivum	1	3	-	1	-	4	-	5	-
Hordeum vulgare	-	6	1	-	4	1	-	-	-
Hordeum, rachis internodes	-	-	-	-	-	-	-	-	-
Avena (fatua)	-	-	-	-	-	-	-	-	-
Cereal grain fragments	0.05	0.21	0.04	0.03	0.16	0.04	0.05	0.03	0.03
Panicum miliaceum	1	10	-	2	6	4	-	-	-
Lens culinaris	-	15	1	2	3	1	4	3	-
Pisum sativum	-	-	-	-	1	-	-	-	-
Linum usitatissimum	-	-	-	-	-	-	-	-	-
Fragaria vesca	-	-	-	-	-	-	3	-	-
Physalis alkekengi	-	3	1	3	4	1	3	-	-
Cornus mas	-	1	-	-	-	-	1	1	-
Malus sylvestris, pips	-	-	-	-	-	-	-	1	-
Rubus fruticosus	-	-	-	-	-	-	5	-	-
Sambucus nigra	-	-	-	-	-	-	-	-	-
Vitis vinifera	-	-	-	-	-	-	1	-	-
Agrostemma githago	-	-	-	-	-	-	-	-	-
Ajuga chamaepitys (type)	-	-	-	-	-	-	-	-	-
Atropa belladonna	-	-	-	-	-	-	-	-	-
Bromus arvensis (type)	-	-	-	-	-	-	-	-	-
Carex	-	-	-	-	-	-	1	-	-
Chenopodium album	3	1	-	1	6	-	25	-	2
Chenopodium hybridum	-	-	-	-	-	-	-	-	-
Chenopodium polyspermum	-	-	-	-	-	-	-	-	-
Chenopodium sp.	-	-	-	-	-	-	-	-	-
Euphorbia helioscopia	-	-	-	-	-	-	-	-	-
Galium spurium (type)	-	-	-	-	-	-	-	-	-
Unident. Gramineae	-	1	-	-	-	-	-	-	-
Plantago lanceolata (type)	-	-	-	-	-	-	-	-	-
Polygonum convolvulus	-	2	-	-	-	1	-	-	1
Rumex sp.	-	-	-	-	-	-	1	-	-
Sambucus ebulus	-	-	-	-	-	-	-	-	-
Weedy *Secale*	-	-	-	-	-	-	-	-	-
Silene	-	-	-	-	-	-	1	-	-
Solanum nigrum	1	-	-	-	-	-	1	-	-
Teucrium chamaedrys/scordium	-	-	-	-	-	-	1	-	-
Trapa natans, spines	-	-	-	-	-	-	-	-	-
Vicia sp.	-	-	1	1	-	-	-	-	-
Unidentified	-	1	-	-	-	-	6	-	-

which could confidently have been identified to the species level, were found at Gomolava. It is assumed here that the oat grains from Vinča and Kostolac levels are of *A. fatua*. Fair numbers of oat grains in some of the Iron Age samples point to the presence of cultivated oat, but wild oat may likewise be represented. Hence, the designation *Avena sativalfatua* in table 4.

Digitaria cf. *sanguinalis*. The *Digitaria* seeds (caryopses) from Gomolava show a fair resemblance to those recovered and illustrated by Kroll (1983: fig. 16:10–12) from Kastanas. Ten caryopses from sample R1 (table 4) measure 1.70 (1.6–1.8) by 0.66 (0.6–0.7) mm, which is slightly more than the Kastanas specimens (Kroll, 1983: table 49). Kroll attributes the Kastanas seeds to *Digitaria sanguinalis*. However, *D. sanguinalis* seeds in the Groningen seed reference collection differ from the Kastanas and Gomolava

Table 3. Numbers of seeds etc. in samples from Kostolac (K) levels. For information on the samples (square, level), see table 1. Cereal grain fragments are in grams.

	Sample number									
	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10
Triticum monococcum	81	36	62	170	25	94	374	54	286	292
Triticum dicoccum	-	-	2	28	6	11	113	11	119	18
Tr. mon./dic., spikelet forks	-	6	2	-	4	3	-	12	11	4
Tr. mon./dic., glume bases	-	-	1	-	1	-	-	7	6	5
Triticum aestivum	3	30	2	-	11	4	-	15	-	31
Hordeum vulgare	4	45	25	-	1200	6	-	12	3	6
Hordeum vulgare nudum	-	-	-	-	500	-	-	1	-	6
Hordeum, rachis internodes	-	-	-	-	-	-	-	1	-	-
Avena (fatua)	-	3	1	-	-	-	-	-	1	-
Cereal grain fragments	0.20	0.68	0.33	1.40	6.63	0.28	2.80	1.11	3.30	1.44
Panicum miliaceum	10	84	52	-	1	14	5	175	64	1
Lens culinaris	-	-	1	-	-	-	-	3	1	1
Vicia ervilia	-	-	-	-	1	-	-	-	-	-
Linum usitatissimum	-	-	1	-	-	-	-	-	-	-
Physalis alkekengi	-	-	-	-	-	-	5	-	-	-
Agrostemma githago	-	-	-	8	-	-	-	-	13	2
Ballota nigra	-	-	-	-	-	-	-	1	-	-
Bromus sp.	-	2	-	-	-	-	-	-	1	1
Carex	-	-	-	-	2	-	-	-	-	-
Chenopodium album	1	1	2	-	-	1	-	1	2	-
Chenopodium hybridum	-	1	-	-	-	-	-	-	-	-
Coronilla	-	-	-	-	-	-	-	-	-	1
Unident. Cyperaceae	1	-	-	-	-	-	-	-	-	-
Digitaria cf. *sanguinalis*	-	-	-	-	-	-	-	-	1	-
cf. *Echinochloa crus-galli*	-	-	1	-	-	-	-	-	-	1
Eleocharis	-	1	-	-	-	-	-	-	-	-
Galium aparine	-	-	-	-	-	-	-	1	1	-
Galium sp.	-	2	2	-	1	1	1	-	1	-
Unident. Gramineae	1	-	2	-	-	-	-	-	1	-
Hyoscyamus (niger)	-	-	1	-	-	-	-	-	-	-
Malva	-	-	-	-	-	-	-	-	1	-
Unident. Malvaceae	-	1	-	-	-	-	-	-	-	-
Nepeta	-	-	-	-	1	-	-	-	-	-
Polygonum aviculare	1	1	-	-	-	-	-	-	-	-
Polygonum convolvulus	1	2	-	-	-	1	-	1	-	-
Rumex pulcher (type)	-	-	-	-	-	1	-	-	-	-
Rumex sp.	-	1	-	-	-	-	-	-	-	-
Sambucus ebulus	1	1	2	-	-	-	-	-	6	1
Scirpus maritimus type	-	1	-	-	-	-	-	-	-	-
Scirpus sp.	-	6	-	-	-	1	-	-	-	-
Solanum nigrum	-	1	-	-	-	-	-	-	-	4
Teucrium chamaedrys/scordium	-	-	2	-	-	1	-	-	-	18
Vicia sp.	-	1	-	-	-	1	-	1	2	3
Unidentified	3	3	1	-	7	-	5	3	2	7

charred specimens, which are distinctly more slender. On the other hand, the modern specimens do correspond with those of *D. sanguinalis* recovered by Knörzer (1971: fig. 2:3) from Iron Age sites in the Rhineland (western Germany), which supports the correctness of the identification of the reference material. Does this imply that the Gomolava (and Kastanas) caryopses cannot be of *D. sanguinalis*? In this connection attention is drawn to the dimensions of *D. sanguinalis* seeds listed in Körber-Grohne's (1991) table 6, in which the measurements of a large number of grass caryopses are presented. The seeds from one of the three sources (the one near Salzburg, Austria) are clearly more slender than those of the other two. The mean length/breadth index of 2.5 obtained from this particular provenance (number of

Table 4. Numbers of seeds etc. in samples from Hallstatt (H), La Tène (LT) and Roman-period (R) levels. For information on the samples (square, level), see table 1. Cereal grain fragments are in grams. Sample H7 is from a Bronze D/Hallstatt A feature.

	Sample number								
	H1	H2	H3	H4	H5	H6	H7	LT1	LT2
Triticum monococcum	3000	900	38	118	194	430	13	78	138
Triticum dicoccum	-	43	41	4	-	26	48	8	25
Tr. mon./dic., spikelet forks	3	270	38	14	47	75	2	17	24
Tr. mon./dic., glume bases	-	38	17	2	40	19	2	-	2
Triticum aestivum	4	-	-	2	-	2	2	45	100
Tr. aestivum, rachis internodes	-	-	-	-	-	-	-	-	-
Triticum aestivum/spelta	-	95	925	-	1295	-	-	-	-
Tr. spelta, spikelet forks	-	-	11	-	133	-	-	-	-
Tr. spelta, glume bases	-	7	12	-	224	-	-	-	-
Hordeum vulgare	-	570	21	209	-	440	58	365	288
Hordeum, rachis internodes	-	-	-	1	-	-	-	-	-
Avena sativa/fatua	-	-	-	-	7	-	-	6	3
Secale cereale	-	-	-	-	8	-	-	-	-
Cereal grain fragments	4.82	5.30	1.64	2.84	5.63	5.84	0.78	2.22	1.75
Panicum miliaceum	2	565	105	400	7500	675	92	735	700
Setaria italica	-	-	-	-	-	1	-	-	-
Lens culinaris	-	170	-	26	-	89	1	1	-
Pisum sativum	-	-	-	3	-	-	-	-	-
Lathyrus sativus	-	-	-	-	-	-	-	-	-
Vicia ervilia	-	8	-	-	-	-	-	-	-
Vicia faba var. *minor*	-	1	-	1	-	2	-	-	-
Cornus mas	-	-	-	-	-	-	1	-	-
Morus nigra	-	-	-	-	-	-	-	-	-
Rubus fruticosus	-	-	-	-	-	-	-	-	-
Sambucus nigra	-	1	-	-	-	-	-	1	-
Adonis	-	1	-	-	-	-	-	-	-
Agrostemma githago	-	6	-	-	4	1	-	1	-
Anchusa officinalis	-	-	-	-	-	-	-	-	-
Atriplex	-	-	-	-	-	-	-	-	-
Unident. Boraginaceae	-	-	-	-	-	-	-	-	1
Brassica nigra	-	-	-	-	-	-	-	-	-
Bromus arvensis (type)	-	1	-	-	3	-	-	1	-
Bromus secalinus (type)	-	2	-	-	2	-	-	-	1
Bromus sterilis	-	10	-	-	-	-	-	-	-
Bromus sp.	-	12	-	1	11	-	1	1	1
Carex	-	1	-	-	-	-	-	-	-
Unident. Caryophyllaceae	-	3	-	-	-	-	1	-	-
Chenopodium album	-	49	17	4	90	4	1	9	85
Chenopodium hybridum	-	6	1	1	44	-	-	1	5
Unident. Compositae	-	-	-	-	-	-	-	-	-
Convolvulus arvensis	-	-	-	-	-	-	-	-	-
Coronilla	-	1	-	-	1	-	-	-	-
Crucianella	-	-	-	-	-	-	-	-	-
Unident. Cruciferae	-	-	-	-	-	-	-	-	1
Digitaria cf. *sanguinalis*	-	-	-	-	1	2	-	-	-
Echinochloa crus-galli	-	-	-	1	-	-	-	1	-
Eleocharis	-	-	-	-	1	-	-	-	-
Erodium	-	-	-	-	-	-	-	-	-
Euphorbia helioscopia	-	-	-	-	-	-	-	-	-
Festuca type	-	2	-	-	-	-	-	-	-
Galium aparine	2	7	-	1	-	-	-	-	12
Galium spurium (type)	-	-	-	-	1	1	1	1	4
Galium tricornutum (type)	-	-	-	-	-	-	-	-	-
Galium sp.	4	18	-	7	-	4	-	1	-
Unident. Gramineae	-	35	5	-	-	-	-	1	7
Hordeum, wild	-	22	-	-	-	-	-	-	-

Table 4 (continued).

	Sample number								
	H1	H2	H3	H4	H5	H6	H7	LT1	LT2
Hyoscyamus (niger)	-	-	-	-	-	-	-	-	-
Knautia arvensis	-	-	-	-	-	-	-	-	-
Unident. Leguminosae	-	23	-	-	-	-	-	-	-
Lithospermum arvense	-	5	-	-	-	-	-	-	6
Malva	-	6	1	-	-	-	-	-	-
Unident. Malvaceae	2	-	-	-	-	-	-	-	-
Nepeta	-	22	-	-	-	-	-	-	-
Phalaris	-	-	1	-	-	-	-	-	-
Plantago lanceolata (type)	-	1	-	-	-	-	-	-	-
Polygonum aviculare	-	116	5	2	-	1	-	-	-
Polygonum convolvulus	1	280	1	1	2	3	7	6	4
Polygonum lapathifolium	-	1	5	-	-	-	-	-	-
Raphanus raphanistrum	-	-	-	-	-	-	-	-	-
Rumex pulcher (type)	-	-	-	-	-	-	-	-	1
Rumex sp.	-	12	-	-	-	-	2	-	-
Sambucus ebulus	-	30	2	-	-	-	6	-	-
Scirpus maritimus type	-	18	-	-	2	-	-	-	-
Scirpus sp.	-	-	1	-	-	1	-	-	2
Weedy *Secale*	-	590	2	5	-	6	2	-	7
Solanum dulcamara	-	-	-	-	-	-	-	-	1
Solanum nigrum	-	-	-	-	3	-	-	-	3
Sparganium	-	3	-	-	-	-	-	-	-
Stachys annua	-	-	-	-	-	-	-	-	1
Teucrium chamaedrys/scordium	-	-	-	-	-	-	-	1	-
Thlaspi arvense	-	1	-	-	-	-	-	-	-
Torilis	-	1	-	-	-	-	-	-	-
Trifolium pratense	-	-	-	-	-	-	-	-	-
Unident. Umbelliferae	-	-	-	-	-	-	-	-	-
Vaccaria pyramidata	-	-	-	-	-	-	-	-	-
Valerianella dentata type	-	4	-	-	-	-	-	-	-
Valerianella rimosa type	-	-	-	-	-	-	-	-	-
Vicia sp.	3	2	-	-	-	-	-	-	-
Xanthium strumarium	-	-	-	-	-	-	-	-	1
Ziziphora	-	4	-	-	-	-	-	-	-
Unidentified	2	40	13	9	7	-	1	-	7

measured seeds is five) corresponds with that of the Gomolava specimens, which is 2.58 (2.47–2.75). Considering the modern seeds from Austria and Kroll's identification of the Kastanas caryopses, the Gomolava grains have, with some reservation, been attributed to *D. sanguinalis*. Only the first to second century AD sample R1 (table 4) yielded a substantial number of *Digitaria* caryopses.

Galium. Among the *Galium* seeds recovered from Gomolava, three types have been distinguished. *Galium aparine* has comparatively large seeds, between 1.8 and 2.2 mm (in a charred condition), with a surface pattern of irregular rows of transversely elongated cells. The seeds of *Galium tricornutum* are of roughly the same size as those of *G. aparine*, but they show a reticulate surface sculpture. A reticulate surface pattern is found also in *Galium spurium*, but in this case the seeds, measuring 1.2–1.7 mm, are smaller than those of *G. tricornutum*. Because of poor preservation and/or absence of typical surface sculpture, a fairly large number of *Galium* seeds could not be attributed to a particular type (*Galium* spec.).

Linum. A small number of *Linum* (flax) seeds were recovered, ranging in length from 2.8 to 3.0 mm. Accounting for a shrinkage through carbonisation of 13%, the original size of the seeds would have been between 3.2 and 3.4 mm, which is quite small for domestic flax, but not uncommon for linseed from prehistoric sites. Kroll (1983: table 39) found similar values for flax seeds from Bronze Age Kastanas. In spite of the rather small size, the Gomolava flax seeds have been attributed to the cultivated species, *Linum usitatissimum.*

Panicum and millet-type grains. Broomcorn millet (*Panicum miliaceum*) was recovered from all levels

Table 4 (continued).

	Sample number									
	LT3	LT4	LT5	LT6	LT7	LT8	LT9	LT10	LT11	LT13
Triticum monococcum	5385	9	96	81	74	127	575	334	23	35
Triticum dicoccum	-	-	-	4	9	-	14	34	2	2
Tr. mon./dic., spikelet forks	13	5	3	2	8	6	50	28	4	1
Tr. mon./dic., glume bases	-	-	-	-	-	-	4	1	1	-
Triticum aestivum	1	1	113	37	115	135	40	33	5	15
Tr. aestivum, rachis internodes	-	-	-	-	-	-	-	-	-	-
Triticum aestivum/spelta	-	-	-	-	-	-	-	-	-	-
Tr. spelta, spikelet forks	-	-	-	-	-	-	-	-	-	-
Tr. spelta, glume bases	-	-	-	-	-	-	-	-	-	-
Hordeum vulgare	4	18	81	200	111	203	160	263	14	33
Hordeum, rachis internodes	-	-	-	-	-	-	-	-	-	-
Avena sativa/fatua	-	-	25	5	44	15	4	4	6	2
Secale cereale	-	-	-	-	-	-	-	-	-	-
Cereal grain fragments	6.74	0.05	1.20	1.95	1.54	1.99	3.00	4.50	0.33	0.60
Panicum miliaceum	3	105	250	440	1080	280	880	750	275	330
Setaria italica	-	-	2	-	9	-	-	-	-	-
Lens culinaris	-	3	2	170	1	3	21	25	8	2
Pisum sativum	-	-	-	-	-	-	-	2	-	-
Lathyrus sativus	-	-	-	2	-	-	-	-	-	-
Vicia ervilia	-	-	-	5	1	-	-	5	-	-
Vicia faba var. *minor*	-	-	-	11	-	-	1	-	-	-
Cornus mas	-	-	-	-	-	-	-	-	-	-
Morus nigra	-	-	-	-	-	-	-	-	-	-
Rubus fruticosus	1	-	-	-	-	-	-	-	-	-
Sambucus nigra	-	1	-	-	-	-	-	-	-	-
Adonis	-	-	-	-	-	-	-	1	-	-
Agrostemma githago	-	-	1	-	-	-	-	1	-	-
Anchusa officinalis	-	-	-	-	1	-	-	-	-	-
Atriplex	-	-	-	-	-	-	-	-	-	-
Unident. Boraginaceae	-	-	-	-	-	-	-	-	-	-
Brassica nigra	-	-	-	-	-	-	-	-	-	-
Bromus arvensis (type)	-	-	-	-	-	-	-	-	-	-
Bromus secalinus (type)	-	-	-	-	-	-	-	-	-	-
Bromus sterilis	3	-	-	-	-	-	-	-	-	-
Bromus sp.	-	-	-	-	-	-	-	1	-	-
Carex	-	-	-	-	-	-	-	-	-	1
Unident. Caryophyllaceae	-	-	-	-	-	-	-	-	-	-
Chenopodium album	-	2	8	9	31	6	4	21	6	5
Chenopodium hybridum	-	-	3	3	4	1	-	2	7	5
Unident. Compositae	-	1	-	-	-	-	-	-	-	-
Convolvulus arvensis	-	-	-	-	-	-	-	-	1	-
Coronilla	-	-	-	-	-	-	-	-	-	-
Crucianella	-	-	-	-	-	1	-	-	-	-
Unident. Cruciferae	-	-	-	-	-	-	-	-	-	-
Digitaria cf. *sanguinalis*	-	-	-	-	-	-	-	-	-	-
Echinochloa crus-galli	-	-	1	-	-	-	-	-	-	-
Eleocharis	-	-	-	-	-	-	-	-	-	-
Erodium	-	-	-	-	-	-	-	-	-	-
Euphorbia helioscopia	-	-	1	-	2	1	1	-	-	-
Festuca type	-	-	-	-	-	-	-	-	-	-
Galium aparine	-	-	-	-	-	-	-	-	-	-
Galium spurium (type)	1	-	-	-	1	-	-	1	-	-
Galium tricornutum (type)	1	-	-	1	-	-	-	-	-	-
Galium sp.	1	2	1	2	2	-	-	5	1	-
Unident. Gramineae	-	-	-	-	1	1	-	9	-	1
Hordeum, wild	-	-	-	-	-	-	-	-	-	-

Table 4 (continued).

	Sample number									
	LT3	LT4	LT5	LT6	LT7	LT8	LT9	LT10	LT11	LT13
Hyoscyamus (*niger*)	-	-	-	-	-	-	-	-	1	-
Knautia arvensis	-	-	-	-	-	-	-	-	-	-
Unident. Leguminosae	-	-	-	-	-	-	-	-	-	-
Lithospermum arvense	-	-	-	-	2	-	-	-	-	-
Malva	-	-	-	1	1	2	-	-	-	-
Unident. Malvaceae	-	-	-	-	-	-	-	-	-	-
Nepeta	-	-	-	1	-	-	-	-	-	-
Phalaris	-	-	-	-	-	-	-	-	-	-
Plantago lanceolata (type)	-	1	-	-	-	-	-	-	-	-
Polygonum aviculare	-	-	1	-	2	1	-	2	-	-
Polygonum convolvulus	6	-	-	2	5	2	3	6	-	-
Polygonum lapathifolium	-	-	-	-	-	-	-	1	-	-
Raphanus raphanistrum	-	-	-	-	-	-	-	1	-	-
Rumex pulcher (type)	-	-	-	-	1	-	-	-	-	-
Rumex sp.	-	-	-	-	-	-	-	1	-	-
Sambucus ebulus	-	3	-	2	1	1	-	-	2	1
Scirpus maritimus type	-	-	2	-	-	3	3	3	-	-
Scirpus sp.	-	-	1	1	1	2	-	-	1	-
Weedy *Secale*	-	-	-	3	-	-	45	70	-	-
Solanum dulcamara	-	-	-	-	-	-	-	-	-	-
Solanum nigrum	-	-	1	-	-	-	-	-	-	-
Sparganium	-	-	1	-	-	1	-	1	-	-
Stachys annua	-	-	-	-	-	-	-	-	-	-
Teucrium chamaedrys/scordium	-	-	-	1	-	-	-	1	-	-
Thlaspi arvense	-	-	-	-	-	-	-	-	-	-
Torilis	-	-	-	-	-	-	-	-	-	-
Trifolium pratense	-	-	1	-	-	-	-	-	-	-
Unident. Umbelliferae	-	-	-	-	-	-	-	-	-	-
Vaccaria pyramidata	-	-	-	-	-	-	-	-	-	-
Valerianella dentata type	-	-	-	-	-	-	-	-	-	-
Valerianella rimosa type	-	-	-	-	-	-	-	-	-	-
Vicia sp.	-	-	6	1	-	3	3	-	-	1
Xanthium strumarium	-	-	-	-	-	-	-	-	-	-
Ziziphora	-	-	-	-	-	-	-	-	-	-
Unidentified	-	6	-	1	5	8	3	8	6	5

examined for seeds. The grains display a considerable variation in shape and size, and fair numbers of small (under-developed) grains were found. Particularly the small and fairly flat grains made one wonder whether they are of another species. However, after careful examination and comparison with modern reference material of wild and cultivated millet-type grains it was concluded that the small grains mentioned above must be of broomcorn millet.

A small number of millet-type grains, retrieved from Iron Age levels (table 4), could definitely be attributed to *Setaria italica* (foxtail millet). In addition, Iron Age levels yielded grains of *Echinochloa crus-galli* (cockspur grass), while two battered grains from Kostolac levels have been assigned to this species with some reservation (table 3).

Physalis alkekengi. The seeds of *Physalis alkekengi* (Chinese lantern) show a fair resemblance to those of those of *Solanum dulcamara* (bittersweet). They are distinguished from the seeds of bittersweet by the size (they are larger) and particularly by the reticulate surface pattern, which is coarser than in bittersweet. In some of the charred seeds the surface sculpture had partly or entirely disappeared. Twenty-five *Physalis* seeds from Gomolava measure 1.68 (1.4–2.0) by 1.40 (1.1–1.6) mm. Kroll (1983: p. 76) reports two *Physalis* seeds from Bronze Age Kastanas. *Physalis alkekengi* is a perennial herb which occurs in woods and wood clearings, and which, as a weed of cultivation, is found in vineyards and arable fields. At present the species is planted in gardens as an ornamental.

Sambucus. Two types of *Sambucus* seeds (pips) were found at Gomolava. The seeds of *Sambucus ebulus* (dwarf elder or danewort) are distinguished from those of *S. nigra* (elder) by the shape. The latter are

Table 4 (continued).

	Sample number									
	LT14	LT15	LT16	LT17	LT18	LT19	LT20	LT21	LT22	LT23
Triticum monococcum	6230	51	384	7	63	147	146	1	8060	36
Triticum dicoccum	95	2	3	7	4	2	7	1	28	9
Tr. mon./dic., spikelet forks	865	3	71	-	11	31	43	2	3	2
Tr. mon./dic., glume bases	128	-	4	-	4	4	-	-	-	-
Triticum aestivum	480	13	37	-	185	94	-	-	990	25
Tr. aestivum, rachis internodes	-	-	-	-	-	-	-	-	-	-
Triticum aestivum/spelta	-	-	-	-	-	-	-	-	-	-
Tr. spelta, spikelet forks	-	-	-	-	-	-	-	-	-	-
Tr. spelta, glume bases	-	-	-	-	-	-	-	-	-	-
Hordeum vulgare	14	43	376	3715	58	94	4905	-	66	29
Hordeum, rachis internodes	-	-	-	-	-	-	-	-	-	-
Avena sativa/fatua	-	2	6	-	270	11	-	-	13	7
Secale cereale	-	-	-	-	-	-	-	-	77	-
Cereal grain fragments	53.11	0.90	3.48	18.56	2.02	1.20	26.20	0.02	30.07	0.55
Panicum miliaceum	112	129	445	965	1650	195	440	410	2970	210
Setaria italica	-	-	-	-	-	-	-	-	-	-
Lens culinaris	1	5	29	2	4	-	8	-	5	2
Pisum sativum	-	-	-	-	-	-	300	-	-	-
Lathyrus sativus	-	-	-	-	-	-	3	-	-	-
Vicia ervilia	-	1	4	-	-	1	-	-	-	-
Vicia faba var. *minor*	-	-	1	31	-	-	32	-	-	-
Cornus mas	-	-	-	-	-	-	-	-	-	-
Morus nigra	-	-	1	-	-	-	-	-	-	-
Rubus fruticosus	-	-	-	-	-	-	-	-	-	-
Sambucus nigra	-	-	1	-	-	-	-	-	-	-
Adonis	-	-	1	-	-	-	-	-	-	-
Agrostemma githago	-	-	-	-	-	-	-	-	21	-
Anchusa officinalis	-	-	-	-	-	-	-	-	-	-
Atriplex	-	-	-	-	-	-	-	-	-	-
Unident. Boraginaceae	-	-	-	-	-	-	-	-	-	-
Brassica nigra	-	-	-	-	-	-	-	-	1	-
Bromus arvensis (type)	6	-	-	-	-	-	2	-	1	-
Bromus secalinus (type)	-	-	-	-	-	-	-	-	-	-
Bromus sterilis	-	-	1	-	-	-	-	-	-	-
Bromus sp.	-	-	-	-	-	1	3	-	3	-
Carex	-	-	-	-	1	-	1	-	-	-
Unident. Caryophyllaceae	-	-	-	-	-	-	-	-	-	-
Chenopodium album	-	5	20	4	71	4	13	1	-	18
Chenopodium hybridum	2	1	1	-	13	1	-	-	6	-
Unident. Compositae	-	-	-	-	-	-	-	-	-	-
Convolvulus arvensis	-	-	-	-	-	-	-	-	-	-
Coronilla	-	-	-	-	-	-	-	-	-	-
Crucianella	-	-	-	-	-	-	-	-	-	1
Unident. Cruciferae	-	-	-	-	-	-	-	-	-	-
Digitaria cf. *sanguinalis*	-	-	-	-	-	-	-	-	-	-
Echinochloa crus-galli	-	1	-	-	-	-	-	-	-	-
Eleocharis	-	-	-	-	-	-	-	-	-	-
Erodium	-	-	-	5	-	-	2	-	-	-
Euphorbia helioscopia	-	-	-	-	-	-	-	-	-	-
Festuca type	-	-	-	-	-	-	-	-	-	-
Galium aparine	-	-	-	-	-	1	1	-	1	-
Galium spurium (type)	-	-	1	-	13	-	2	-	-	1
Galium tricornutum (type)	-	-	-	-	-	-	1	-	-	-
Galium sp.	-	-	5	-	-	2	5	-	-	2
Unident. Gramineae	1	3	1	-	-	4	2	-	4	-
Hordeum, wild	-	-	2	-	-	-	-	-	-	-

Table 4 (continued).

	Sample number									
	LT14	LT15	LT16	LT17	LT18	LT19	LT20	LT21	LT22	LT23
Hyoscyamus (niger)	-	-	-	-	-	-	-	-	-	-
Knautia arvensis	-	-	-	-	1	-	-	-	-	-
Unident. Leguminosae	-	-	2	-	-	-	-	-	-	-
Lithospermum arvense	-	-	1	-	-	-	-	-	-	-
Malva	-	-	1	-	-	-	-	-	-	-
Unident. Malvaceae	-	-	-	-	-	-	-	-	-	-
Nepeta	-	-	-	-	-	-	-	-	-	-
Phalaris	-	-	-	-	-	-	-	-	-	1
Plantago lanceolata (type)	-	1	-	-	-	-	-	-	-	-
Polygonum aviculare	-	-	6	1	-	-	10	-	-	-
Polygonum convolvulus	1	-	20	2	2	-	2	-	11	2
Polygonum lapathifolium	-	-	1	-	-	-	-	-	-	-
Raphanus raphanistrum	-	-	-	-	-	-	-	-	-	-
Rumex pulcher (type)	-	-	-	-	-	-	-	-	-	-
Rumex sp.	1	-	3	-	-	-	-	-	1	-
Sambucus ebulus	-	-	-	-	1	-	1	-	1	-
Scirpus maritimus type	-	1	-	-	-	1	-	-	-	1
Scirpus sp.	-	-	-	-	4	2	1	-	-	2
Weedy *Secale*	5	-	23	17	-	-	9	-	-	-
Solanum dulcamara	-	-	-	-	-	-	-	-	-	-
Solanum nigrum	-	-	-	-	-	-	-	-	-	1
Sparganium	-	-	-	-	-	-	-	-	-	-
Stachys annua	-	-	-	-	-	-	-	-	-	-
Teucrium chamaedrys/scordium	-	-	-	-	-	-	-	-	-	-
Thlaspi arvense	-	-	-	-	-	-	-	-	-	-
Torilis	-	-	-	-	-	-	-	-	-	-
Trifolium pratense	-	-	-	-	-	-	-	-	-	-
Unident. Umbelliferae	-	-	1	-	-	-	-	-	-	-
Vaccaria pyramidata	-	-	-	-	-	1	-	-	-	-
Valerianella dentata type	-	-	-	-	-	-	-	-	-	-
Valerianella rimosa type	-	-	1	-	-	-	-	-	-	-
Vicia sp.	-	1	4	-	-	-	-	-	1	2
Xanthium strumarium	-	-	-	-	-	-	-	-	-	-
Ziziphora	-	-	-	-	-	-	-	-	-	-
Unidentified	3	2	3	6	-	1	9	-	1	6

more slender. In contrast to elder, which is a shrub or small tree, dwarf elder is a perennial herb. Its natural habitat is moist forest, but in Europe it is found particularly in disturbed habitats, such as waysides and waste places. At the time of the excavations it was common in the area of the tell, and it probably was the same in prehistoric times. The berries may have been gathered for dyeing textiles, colouring wine or other alcoholic beverages, and/or for medicinal purposes. Elder (*S. nigra*) is less well represented in the Gomolava seed record than dwarf elder. The berries of *S. nigra* are still gathered from the wild and made into jam, juice and elderberry wine. In particular the flowers are used as a medicine, but this practice would not have left any traces in the archaeobotanical record.

The representation of *Sambucus ebulus* at Gomolava poses a problem in that in addition to charred seeds, also uncharred specimens of this species were found. The uncharred seeds are clearly no modern intrusions, but are they of the same age as the charred ones? In some of the levels in Ottaway's 2×2 m sondage (see Section 1.4) uncharred dwarf-elder seeds outnumber charred specimens by far (Bottema & Ottaway, 1982: fig. 5). In the present study only charred *Sambucus* seeds are included (tables 2–4). In fact, the uncharred seeds have been discarded without counting the numbers, which, on second thoughts, was a mistake. The dwarf-elder seeds recovered from Kastanas were also predominantly in an uncharred condition (Kroll, 1983).

Scirpus (club-rush) seeds at Gomolava range in size from 1.7 to 2.7 mm, the majority measuring about 2 mm. More than half of them match the small type *Scirpus maritimus* seed described from Near Eastern sites (cf. van Zeist & Bakker-Heeres, 1982: p. 217, fig. 24.5). Others have not been attributed to a par-

Table 4 (continued).

	Sample number							
	LT24	LT25	LT26	LT27	LT28	LT29	R1	R2
Triticum monococcum	280	40	12	19	57	-	20	20
Triticum dicoccum	13	4	-	-	-	-	-	-
Tr. mon./dic., spikelet forks	4	11	6	19	7	-	8	24
Tr. mon./dic., glume bases	-	5	-	12	6	-	8	23
Triticum aestivum	-	-	47	-	36	-	2	-
Tr. aestivum, rachis internodes	-	1	-	-	-	-	-	-
Triticum aestivum/spelta	112	59	-	140	-	-	-	65
Tr. spelta, spikelet forks	2	1	-	14	-	-	-	4
Tr. spelta, glume bases	1	1	-	7	-	-	-	4
Hordeum vulgare	128	32	18	12	47	-	359	1455
Hordeum, rachis internodes	-	-	-	-	-	-	-	1
Avena sativa/fatua	38	19	153	26	5	-	-	1
Secale cereale	-	-	-	-	-	-	-	-
Cereal grain fragments	2.65	0.78	0.36	0.98	0.60	-	4.33	9.35
Panicum miliaceum	210	1030	360	1600	620	-	2800	57
Setaria italica	-	-	-	-	1	-	-	-
Lens culinaris	3	10	2	2	7	-	6	-
Pisum sativum	1	1	-	-	2	-	-	-
Lathyrus sativus	-	-	-	-	-	-	-	-
Vicia ervilia	-	1	-	-	1	-	-	-
Vicia faba var. *minor*	-	1	-	-	3	14	13	-
Cornus mas	-	-	-	-	-	-	-	-
Morus nigra	-	-	-	-	-	-	-	-
Rubus fruticosus	-	-	-	-	-	-	-	-
Sambucus nigra	-	-	-	1	-	-	-	-
Adonis	-	-	-	-	-	-	-	-
Agrostemma githago	-	-	-	-	-	-	-	-
Anchusa officinalis	-	-	-	-	-	-	-	-
Atriplex	-	1	-	-	-	-	-	-
Unident. Boraginaceae	-	-	-	-	-	-	-	-
Brassica nigra	-	-	-	-	-	-	-	-
Bromus arvensis (type)	-	1	-	-	-	-	-	-
Bromus secalinus (type)	-	-	-	-	-	-	-	-
Bromus sterilis	-	-	-	-	-	-	-	-
Bromus sp.	-	-	-	-	1	-	-	1
Carex	-	-	-	-	-	-	-	-
Unident. Caryophyllaceae	-	-	-	-	-	-	-	-
Chenopodium album	9	7	29	20	22	-	20	4
Chenopodium hybridum	1	14	20	16	1	-	1	-
Unident. Compositae	-	-	-	-	-	-	-	-
Convolvulus arvensis	-	-	-	-	-	-	-	-
Coronilla	-	-	-	-	-	-	-	-
Crucianella	-	-	-	-	1	-	-	-
Unident. Cruciferae	-	-	-	-	-	-	-	-
Digitaria cf. *sanguinalis*	-	1	-	-	-	-	45	-
Echinochloa crus-galli	-	-	1	3	-	-	1	-
Eleocharis	1	-	-	-	-	-	-	-
Erodium	-	-	-	-	-	-	-	-
Euphorbia helioscopia	-	-	-	-	-	-	-	-
Festuca type	-	-	-	-	-	-	-	-
Galium aparine	-	2	-	-	-	-	2	-
Galium spurium (type)	-	1	-	1	2	-	-	-
Galium tricornutum (type)	-	-	-	-	-	-	-	-
Galium sp.	2	7	-	-	-	-	2	-
Unident. Gramineae	1	-	-	-	-	-	-	-
Hordeum, wild	-	-	-	-	-	-	-	-

Table 4 (continued).

	Sample number							
	LT24	LT25	LT26	LT27	LT28	LT29	R1	R2
Hyoscyamus (*niger*)	-	-	-	-	-	-	-	-
Knautia arvensis	-	-	-	-	-	-	-	-
Unident. Leguminosae	-	-	-	-	-	-	-	-
Lithospermum arvense	1	-	-	-	-	-	-	1
Malva	-	1	-	-	-	-	-	-
Unident. Malvaceae	-	-	-	-	-	-	-	-
Nepeta	-	-	-	-	-	-	-	-
Phalaris	-	-	-	-	-	-	-	-
Plantago lanceolata (type)	-	-	-	-	-	-	-	-
Polygonum aviculare	8	-	-	-	1	-	-	-
Polygonum convolvulus	-	-	-	-	2	-	-	16
Polygonum lapathifolium	-	-	-	-	-	-	-	-
Raphanus raphanistrum	-	-	-	-	-	-	-	-
Rumex pulcher (type)	-	-	-	-	-	-	-	-
Rumex sp.	-	-	-	-	1	-	-	1
Sambucus ebulus	-	1	1	-	-	-	-	-
Scirpus maritimus type	-	1	1	-	-	-	-	-
Scirpus sp.	1	2	2	-	1	-	-	-
Weedy *Secale*	-	-	-	-	-	-	10	6
Solanum dulcamara	-	-	-	-	-	-	-	-
Solanum nigrum	1	-	1	2	-	-	-	1
Sparganium	-	-	-	-	-	-	-	-
Stachys annua	-	-	-	1	-	-	-	-
Teucrium chamaedrys/scordium	1	-	-	-	-	-	-	-
Thlaspi arvense	-	-	-	-	-	-	-	-
Torilis	-	-	-	-	-	-	-	-
Trifolium pratense	-	-	-	-	-	-	-	-
Unident. Umbelliferae	-	-	-	-	-	-	-	-
Vaccaria pyramidata	-	-	-	-	-	-	-	-
Valerianella dentata type	-	-	-	-	-	-	-	-
Valerianella rimosa type	-	-	-	-	-	-	-	-
Vicia sp.	1	-	1	1	-	-	-	-
Xanthium strumarium	-	-	-	-	-	-	-	-
Ziziphora	-	-	-	-	-	-	-	-
Unidentified	2	2	2	4	6	-	3	2

ticular type (*Scirpus* sp.). Club-rush species are usually found in damp places and at watersides. No *Scirpus* seeds were recovered from Vinča levels.

Secale. In addition to cultivated rye (*Secale cereale*) represented in a few Iron Age samples (table 4), a second form of rye has been identified from Gomolava. This rye is considered to have occurred as a weed in the cornfields of the Gomolava farmers. So far, we are in the dark as to possible modern equivalents of the weedy rye from Gomolava and Kastanas (see below). Its taxonomic affinity is uncertain; we do not know whether it was a shattering or a non-shattering rye. For that reason this type of archaeological rye is indicated here simply as 'weedy *Secale*'.

The identity of the grains concerned remained uncertain for a long time. Some of them remind one of small, slender wheat grains (a bit like two-grained einkorn wheat), whereas others turned the scale to rye, although clearly differing from those of the cultivated rye found at Gomolava. It was the weedy rye described and illustrated by Kroll (1983) from Kastanas in Greece which convinced the author that at Gomolava we are dealing with a similar form of rye.

In the weedy rye from Gomolava, the basal end with the radicle shield is pointed, whereas the (upper) apical end is truncated, but there are also grains with a gradually tapering upper part (these are the ones with a wheat-like appearance). In lateral view, the dorsal side is usually straight or only slightly curved. Various specimens show a longitudinal keel on the dorsal side. The grains show a fairly large variation in shape and size, but in general they have a slender appearance, which finds expression in comparatively high L:B index values (table 5). The average length of about 4 mm is considerably smaller than that of domestic rye.

Weedy rye must have been present already in Vinča times (it was found in two samples from that period), but it was much more common at Iron Age Gomolava (Hallstatt and La Tène periods): its grains were identified from a fair number of Iron Age samples (table 4, fig. 5). A particularly large number of grains of this type was counted in sample H2. The Bronze Age is not represented in the Gomolava seed record, so that it cannot be determined whether weedy rye had developed into a common cornfield weed already before the Iron Age.

Teucrium seeds retrieved from Gomolava have a fairly smooth surface (no reticulate sculpture) and a relatively large, round hilum. Eleven seeds from Kostolac sample K10 (table 3) measure 1.29 (1.2–1.4) by 1.02 (0.9–1.1) mm; length/breadth index 1.26 (1.18–1.43). The seeds compare well with those from Kastanas attributed by Kroll (1983: p. 82) to *Teucrium chamaedrys* (wall germander), a low perennial species of dry places. However, *T. scordium* (water germander), a species of damp places, with similar seeds as *T. chamaedrys*, may as well come into consideration. Hence, the designation *Teucrium chamaedrys/scordium* in tables 2–4. Both *Teucrium* species are reported from the Fruška Gora range and surroundings (Čolovič, 1956).

Trapa natans. Two Vinča samples (table 2) yielded spine remains of *Trapa natans* (water chestnut). The species may have occurred in quiet corners and old meanders of the Sava river. The Neolithic occupants of the site may have used the flour of the hard-walled nuts for human nutrition. According to Sturtevant (Hedrick, 1972: 573–574), the nuts were used for food in various parts of the world, among which southern Europe.

Triticum. In all periods represented in the seed record, einkorn wheat (*Triticum monococcum*) predominates over emmer wheat (*Triticum dicoccum*). It has not been attempted to separate the chaff remains (spikelet forks, glume bases) of einkorn wheat from those of emmer wheat, but the majority of them are clearly of the *monococcum* type. In some of the Iron Age samples wheat grains were found which remind one of those of spelt wheat, *Triticum spelta*. This observation is supported by the presence, in the same samples, of chaff which could convincingly be identified as that of spelt wheat. A differentiation between the grains of bread wheat (*Triticum aestivum*) and spelt wheat was only partly possible, hence the designation *Triticum aestivum/spelta* in table 4.

3. CULTIVATED AND WILD FOOD PLANTS

In discussing the crop plants identified from a multi-period site like Gomolava the question arises as to what extent differences between periods are evident. With the aim of making possible changes in crop-plant assemblages more clearly visible, the sample frequencies of cultivated (and some wild) species, expressed as percentages, are presented in figure 5.

3.1. Cereals

The main cereals cultivated at Gomolava were einkorn wheat (*Triticum monococcum*), emmer wheat (*Triticum dicoccum*), bread wheat (*Triticum aestivum*), hulled six-rowed barley (*Hordeum vulgare*) and broomcorn millet (*Panicum miliaceum*). These species played a part in the diet of the inhabitants of the site through all periods represented in the seed record. However, there are differences between periods. Thus, barley is less well represented in the Vinča period; not only is the sample frequency lower than in the other periods (fig. 5), but also the numbers of grains recovered are usually small (table 2). In the La Tène period, on the other hand, barley may have been of (almost) equally great importance as wheat.

Free-threshing or naked barley (*Hordeum vulgare* var. *nudum*) was retrieved from Kostolac levels only. In this connection particular attention is paid to sample K5 (table 3). The large number of naked barley grains in this sample indicates that this variety was grown on purpose, either as a crop in its own right or mixed with hulled barley, which is the predominant crop in the sample concerned. The concentration of naked and hulled barley grains was found on and between the charred remains of a basket, in which apparently the crop had been stored.

Through all periods einkorn wheat must have been of far greater importance than emmer wheat. This predominance of einkorn wheat may have been typical not only of Gomolava but of a much wider area (see below: Gradina/Bosut). In fact, in terms of grain size the Gomolava einkorn wheat was by no means inferior to emmer wheat (compare figs 3a and 3b). One wonders whether emmer wheat was cultivated as a crop in its own right or mixed with einkorn wheat only. The proportions of einkorn and emmer wheat in most of the samples consisting of the remains of corn supplies, characterised by (comparatively) large numbers of cereal grains, could be adduced in support of the suggestion that emmer wheat was a minor admixture to einkorn wheat only. However, in a few other samples of the remains of cereal crop supplies, numbers of emmer wheat grains are quite high relative to those of einkorn wheat (e.g., table 3: K7 and K9), and in sample VP28 (table 2)

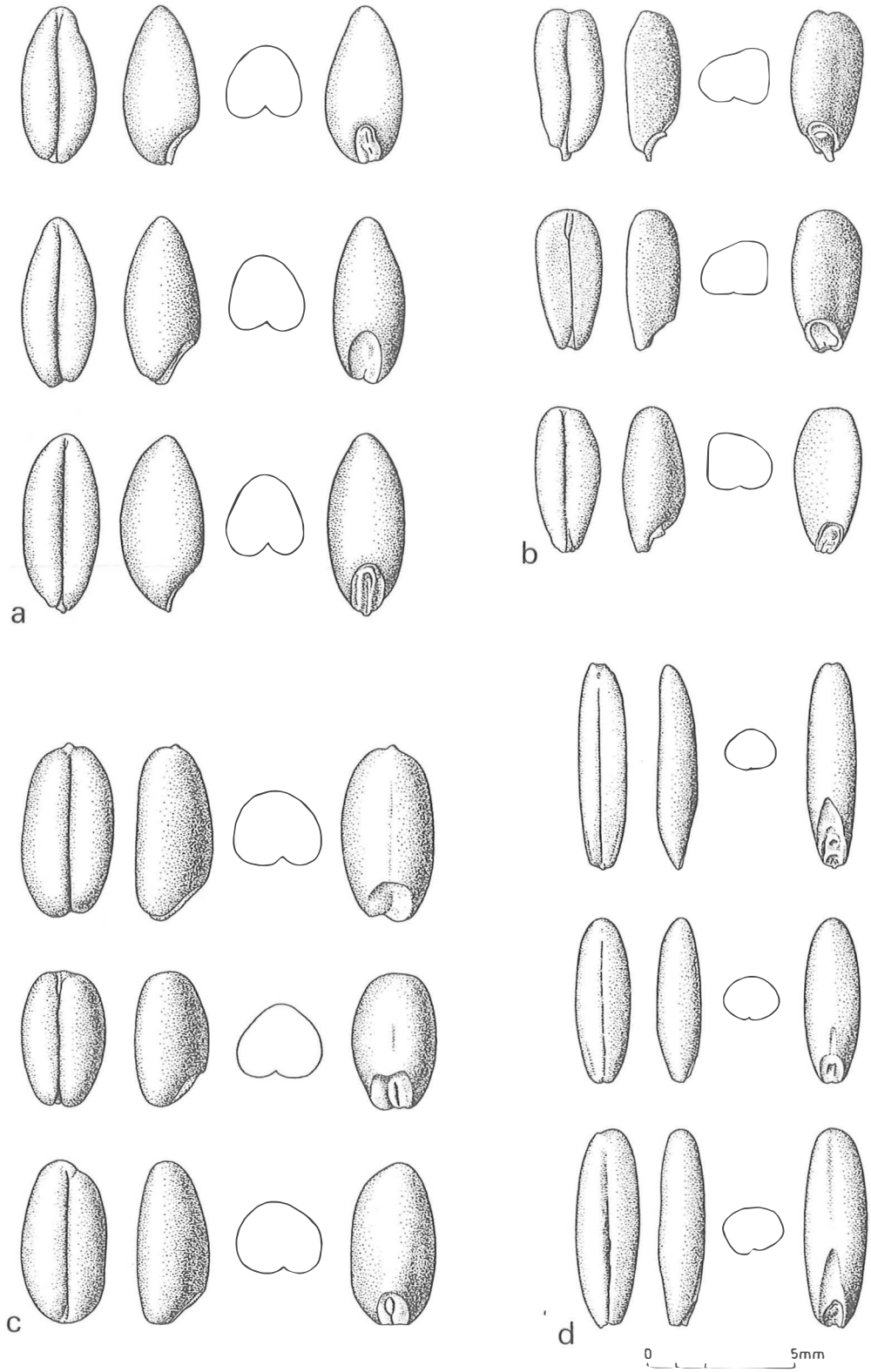

Fig. 3. a. *Triticum monococcum* (La Tène); b. *Triticum dicoccum* (Vinča-Pločnik C); c. *Triticum aestivum* (La Tène); d. *Avena sativa* (La Tène).

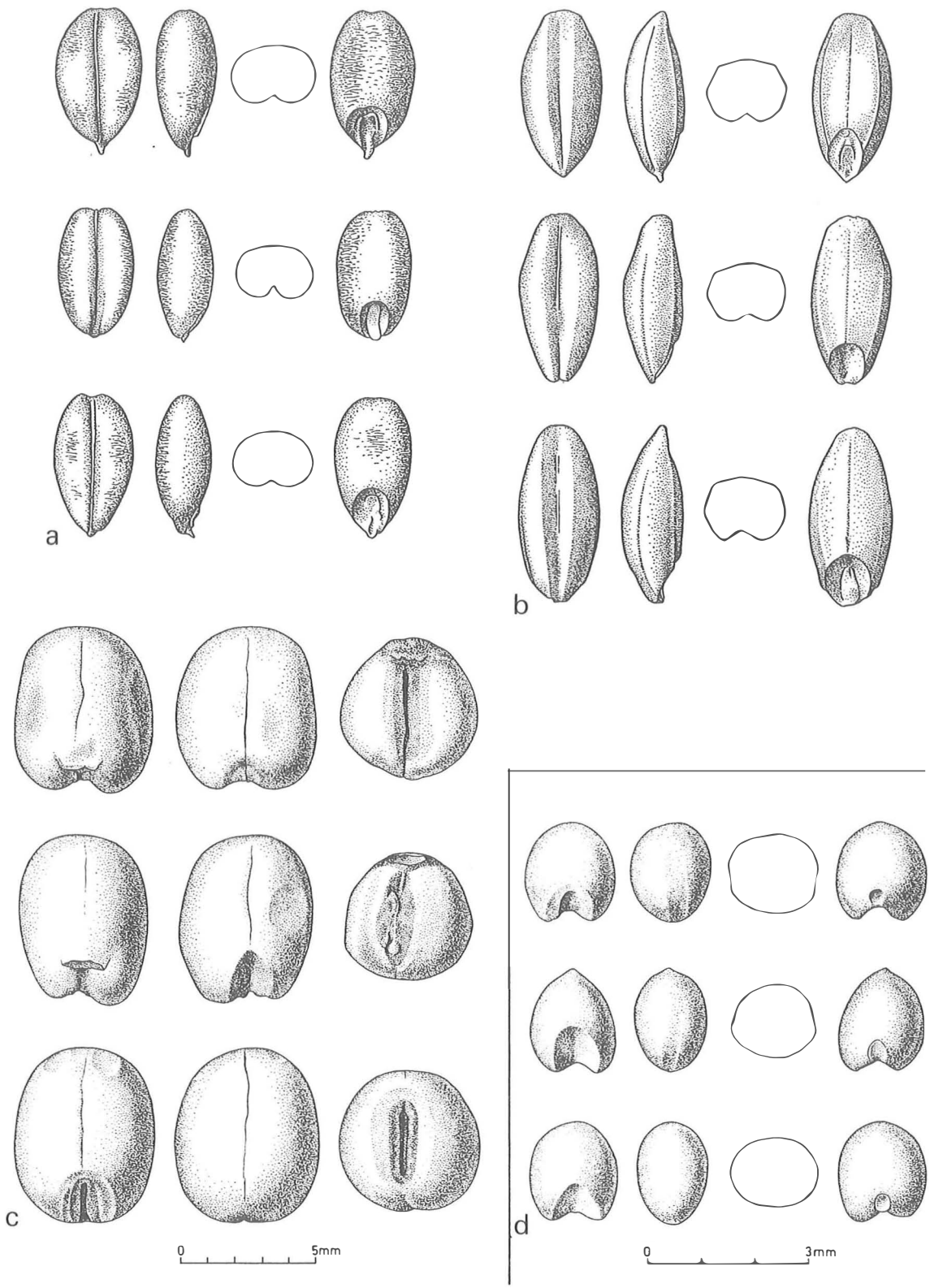

Fig. 4. a. *Hordeum vulgare* var. *nudum* (Kostolac); b. *Hordeum vulgare* (Kostolac); c. *Vicia faba* var. *minor* (La Tène); d. *Panicum miliaceum* (La Tène).

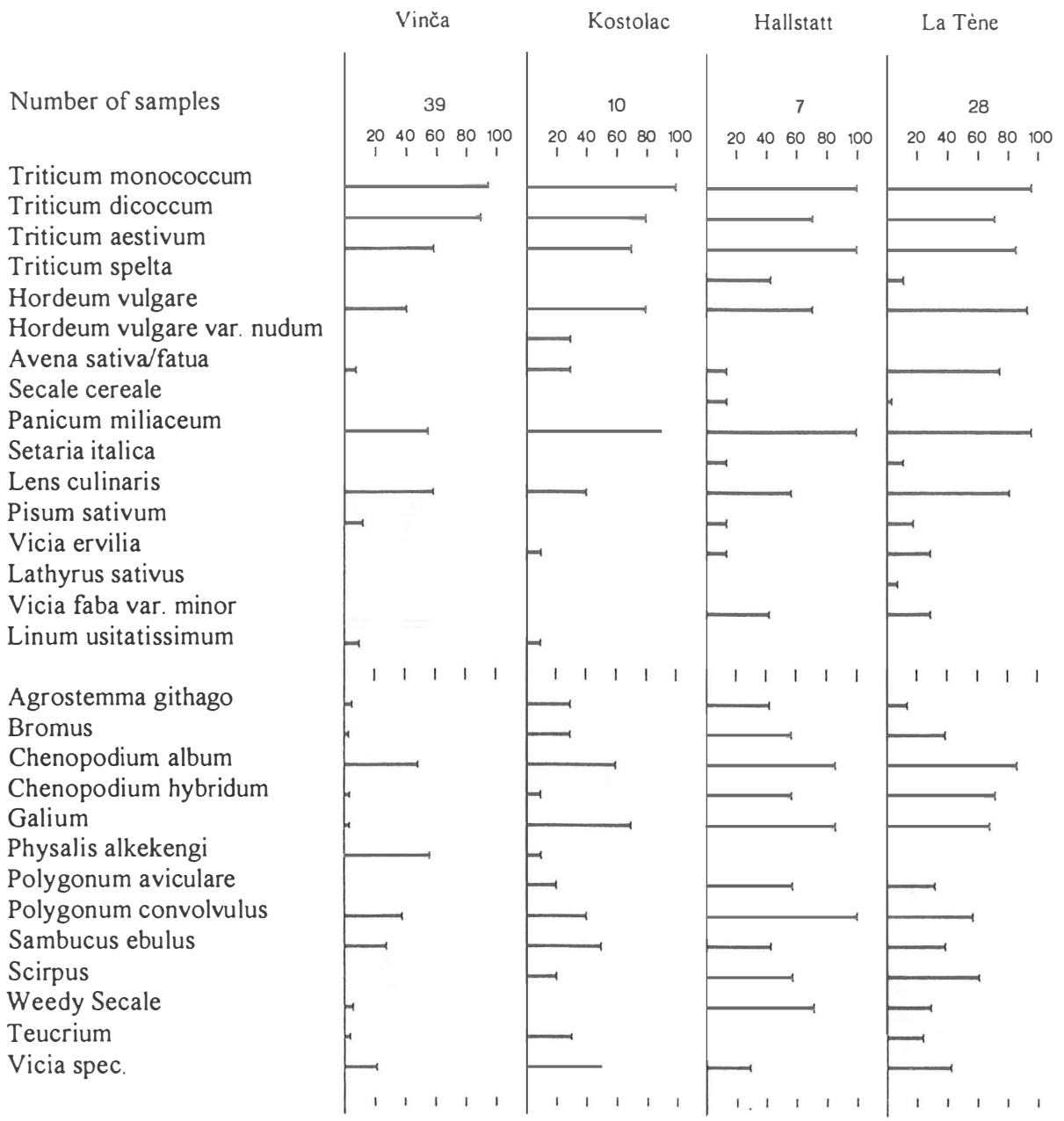

Fig. 5. Representation (sample frequencies expressed as percentages) of cultivated plants and some wild plant taxa.

Table 5. Dimensions in mm and index values of grains of weedy *Secale*. L length; B breadth; T thickness. The protruding radicle point, if present, has not been included in the measurements.

		L	B	T	L:B	T:B
H2	min.	3.2	1.0	1.0	2.19	0.83
$N = 50$	mean	4.04	1.57	1.50	2.61	0.96
	max.	5.1	2.0	1.9	3.33	1.13
LT9	min.	3.2	1.2	1.2	2.14	0.75
$N = 19$	mean	3.94	1.60	1.50	2.49	0.95
	max.	4.8	2.2	1.9	2.94	1.07

emmer wheat is even more numerous than einkorn wheat. This does not answer the question of whether emmer wheat was grown also as a separate crop, but at least it shows that emmer was not always a minor admixture to einkorn only.

Particularly in the La Tène period, free-threshing bread wheat must have gained in importance. This does not necessarily imply a reduction of the einkorn acreage, but more land may have been taken into cultivation to feed a growing population. The role of a third glume wheat, viz. spelt wheat (*Triticum spelta*) identified from Hallstatt and La Tène levels, is not clear. As has already been mentioned, the differentiation between the grains of bread wheat and spelt wheat caused difficulties. Judging from the sample frequencies (fig. 5), which in this case are based upon the presence of spikelet remains (spikelet forks, glume bases), spelt wheat may have been rather commonly cultivated in Hallstatt times, but was of only minor importance in the La Tène period.

As has already been mentioned, it is assumed here that the oat grains secured from Vinča and Kostolac levels are of wild oat (*Avena fatua*), which is a weed of cornfields. Common oat (*Avena sativa*) is thought to have been cultivated at Iron Age Gomolava, this on the basis of the appreciable numbers of oat grains in some of the La Tène samples, particularly samples LT18 and LT26 (table 4). The proportion of wild oat among the Iron Age oat grains cannot be determined. One wonders whether the shift to oat cultivation was associated with the introduction of horse traction.

Evidence of rye (*Secale cereale*) cultivation is confined to one Hallstatt (H5) and one La Tène (LT22) sample. Apparently, this crop played a minor role only at Iron Age Gomolava. As on the fertile loess soil of the Gomolava area more demanding cereals could profitably be grown, there was no reason to cultivate a crop which was less appreciated for human consumption.

The 'latecomers' spelt wheat, common oat and rye did not supersede any of the traditionally grown cereals, but were cultivated in addition to the ones which had been grown here from Vinča times onward.

Broomcorn millet (*Panicum miliaceum*) shows a history comparable to that of hulled barley: a relatively modest role in Vinča times and very common in Hallstatt and La Tène levels. A second millet crop, foxtail millet (*Setaria italica*), is hardly represented at Gomolava and may have occurred as an impurity in broomcorn-millet fields only. In assessing the role of broomcorn millet in the diet of the inhabitants, it should be taken into account that, as for weight, six to seven millet grains correspond to one wheat or barley grain. The broomcorn millet in sample LT21 (table 4) is of unthreshed crop. Here most of the grains are still enclosed by the glumes.

In the 2×2 m sondage, Bottema and Ottaway (1982) obtained high concentrations of crop-plant seeds (numbers of seeds per unit volume of soil) from Hallstatt and La Tène levels and low ones from Vinča levels. Various explanations for the considerable increase in numbers of seeds can be adduced, such as a lower rate of soil accumulation, changes in crop-processing practices, a higher incidence of fires, and increased agricultural production. Be this as it may, a similar increase in numbers of seeds is evident also from the present study, although to a lesser extent than in the 2×2 m sondage. It looks as though the frequencies of millet, barley and bread wheat had increased proportionally more than those of einkorn and emmer wheat.

The food-plant record of Hallstatt Gomolava does not stand alone in that similar information is available from the site of Gradina on the Bosut river, like Gomolava on the southern edge of Central European Plain (fig. 1). Hallstatt occupation here is covered by La Tène deposits of up to two metres thick. In 1973, three series of soil samples (A, B, C) were secured from exposed sections of the site by S. Bottema and the present author. The food-plant assemblage obtained from the Hallstatt samples of series C, shown in table 6, corresponds well with that of Gomolava: einkorn-wheat frequencies are much higher than those of emmer wheat; barley and broomcorn millet play an important part, and in addition to bread wheat, spelt wheat is represented. Among the pulses, lentil is most common (see below).

The two samples from second century AD levels (table 4: R1 and R2) suggest quite a change compared to the previous periods. Among the large-grained cereals, barley is now by far predominant. One wonders whether, in one way or another, this shift was connected with the Roman presence in the area.

3.2. Pulses

Among the pulses, lentil (*Lens culinaris*) is by far best represented. It was found in more than half of the samples (fig. 5), be it usually in small numbers. Lentil must have played a substantial role in the diet of the inhabitants of the site. In this connection it should be taken into account that, compared to cereal grains, lentils and other pulse-crop seeds are usually underrepresented in the charred seed record. As in other prehistoric sites, lentil at Gomolava was of the small-seeded form (var. *microsperma*): the greatest diameter of sixty seeds from sample H2 varies from 2.2 to 4.2 mm (mean 3.12 mm).

Pea (*Pisum sativum*) is represented in a rather small number of samples, usually by one or a few seeds only. Convincing evidence of the intentional cultivation of pea is provided by the find of c. 300 seeds in sample LT20 (table 4), but one may safely

Table 6. Numbers of seeds etc. of cereals and pulses in Hallstatt C samples from Gradina/Bosut (series C). Cereal grain fragments are in grams.

Sample number	14	15	16	17	18
Metres below top of mound	3.55–3.75	3.85–4.05	4.20–4.40	4.50–4.65	4.75–4.90
Triticum monococcum	118	230	90	1150	70
Triticum dicoccum	24	23	6	39	6
Tr. mon./dic., spikelet forks	19	45	58	76	86
Tr. mon./dic., glume bases	4	10	9	18	15
Triticum aestivum (+ *spelta*)	68	190	45	358	10
Tr. spelta, spikelet forks	2	-	-	2	1
Tr. spelta, glume bases	1	-	-	2	10
Hordeum vulgare	75	195	40	448	18
Avena sativa/fatua	-	-	-	1	-
Cereal grain fragments	2.73	7.28	2.66	28.96	1.53
Panicum miliaceum	144	770	530	2680	630
Setaria italica	2	1	-	-	1
Lens culinaris	18	9	5	9	5
Pisum sativum	3	-	-	3	-
Vicia ervilia	-	-	-	2	-
Vicia faba var. *minor*	2	-	2	-	-

assume that it has been a crop plant of the Gomolava farmers through all periods of occupation of the site. Fifty peas from sample LT20 measure 3.1 to 4.5 mm, with a mean value of 3.68 mm.

The other pulses identified from Gomolava, viz. bitter vetch (*Vicia ervilia*), broad bean (*Vicia faba* var. *minor*) and grass pea (*Lathyrus sativus*), have not been found in Vinča deposits, but are all represented in Iron Age levels. These three pulses have been recorded from a large number of archaeological sites. Cultivation of the small-seeded variety of broad bean or faba bean expanded over a large part of Europe, that of grass pea and bitter vetch was largely confined to the Near East, Southeast Europe and the Mediterranean region. Consumption of large amounts of bitter vetch and grass pea seeds is a risk, unless proper precautions are taken. These seeds contain a poisonous substance which should be removed, by soaking in water, before being prepared for human consumption. At Gomolava, the role of grass pea seems to have been insignificant. One could even doubt whether it had been grown intentionally. Could grass pea have occurred as an impurity of one of the other pulse crops?

3.3. Oil plants

The role of flax or linseed (*Linum usitatissimum*) in the plant husbandry of Gomolava is not quite clear. Four samples yielded each one seed, while a small number of seeds were retrieved from sample VP9 (table 2). Flax may have grown primarily for its seeds, from which oil is extracted and which were also consumed as such. It is also possible that the fibres, obtained from the stem of the plants and used for the manufacture of linen cloth, were the main objective of flax cultivation. In that case the seeds would have been a useful side-product.

As for the poor representation of flax, it should be taken into account that in carbonisation the oleaginous seeds easily get destroyed. On the other hand, various archaeological sites have yielded appreciable numbers of charred flax seeds, suggesting that charred remains are not scarce if flax had played a prominent role in the economy of the site concerned.

Iron Age levels at Gomolava did not provide evidence of flax, but one flax seed was found in a Hallstatt sample from Gradina/Bosut not shown in table 7, suggesting that in the region between Sava and Danube cultivation of this crop had continued into the Iron Age.

Opium poppy (*Papaver somniferum*) is conspicuously absent from the seed record, although at present the species is cultivated in the area. Here, the seeds are not used for extracting oil, but they are an ingredient in making pastries and such like. No seeds of wild plants from which oil could have been extracted were retrieved. Vegetable oil seems to have been at most of minor importance, and one must assume that most of the fat consumed by the inhabitants was of animal origin.

3.4. Fruits

The fruits identified from Gomolava could, with one exception, have been collected from the wild. The exception concerns *Morus* cf. *nigra* (black mulberry),

Table 7. Representation of tree taxa (wood charcoal) in various periods.

Period	Vinča-Pločnik	Kostolac	Late Bronze/ Early Hallstatt	Hallstatt	La Tène
Number of samples	8	4	3	6	16
Quercus (oak)	+++	+++	++	+++	+++
Ulmus (elm)	+	++	++	+	++
Fraxinus (ash)	-	++	-	+	+
Populus (poplar)	++	-	-	++	-
Tilia (linden)	+	-	+	-	+
Acer (maple)	+	-	+	+	+
Carpinus (hornbeam)	-	+	-	-	-
Juniperus (juniper)	-	-	-	-	+

+++ much; ++ fairly much; + present.

one seed (pip) of which was found in La Tène sample LT16. Charred seeds of *Morus nigra* cannot be distinguished from those of *Morus alba* (white mulberry), but the former is the most likely candidate at Gomolava. This species of central Asian origin was cultivated in the Mediterranean region in the first millennium BC; the earliest find there is of seventh century Samos (Kučan, 1995). As the purple, raspberry-like fruits easily bruise, import from elsewhere may be ruled out, implying that mulberry was cultivated in the Gomolava area. This fruit is the only evidence of some sort of contact with the Mediterranean region. Thus, no remains were found of fig or olive which could easily have been brought in from quite some distance.

Wild apple or crab apple (*Malus sylvestris*) is represented in a few samples only, but there is convincing evidence of the intentional gathering of this fruit. From below a Vinča oven charred remains of crab apples were retrieved, corresponding to about ten whole specimens (VP18, not shown in table 2). Of five apples the largest diameter could be determined: 16.3, 17.3, 19.4, 19.4 and 20.1 mm. Sample VP19 (likewise not shown in table 2), from underneath sample VP18 and probably from the same context, yielded a great number of apple fragments which, on the basis of weight, should correspond to a good ten whole fruits. In addition, 214 loose apple pips and a few seeds of some other species were recovered from this sample. The apples had not been cut into halves for drying, as has been observed in apples from lakeshore dwelling sites of central Europe.

An almost globular fruit, handpicked from a La Tène context (sample LT12), shows much resemblance to that of a wild *Pyrus* species collected in Greece. The charred archaeological specimen is 13 mm high and 16 mm broad, while two modern fruits measure 12.5 by 15.7 and 10.3 by 11.6 mm. A single wild pear is not sufficient evidence of the gathering of this fruit for human consumption, but it proves that the species was found in the area.

Among the wild fruits consumed at Gomolava, Cornelian cherry (*Cornus mas*) is comparatively well represented in Vinča levels. It is a shrub or small tree, up to 8 m high, which is native to Southeast and central Europe. The elliptic fruits are about 1.5 cm long and bright red when ripe. The fruit can be eaten raw or as a preserve.

By far best represented among the wild fruits is *Physalis alkekengi* (Chinese lantern), but the species is absent from Iron Age levels (fig. 5). In Vinča times, the orange to scarlet fruits, called winter cherries, must have been commonly consumed at Gomolava. Other wild fruits identified from Gomolava include elder (*Sambucus nigra*), blackberry (*Rubus fruticosus*), strawberry (*Fragaria vesca*) and grape (*Vitis vinifera*). The single grape pip is in contrast to the luxuriant growth of wild grapevine along the Sava near Gomolava. The archaeological grape pip is of the wild form.

Wild fruits are much better represented in the Vinča period than in the Iron Age. One wonders whether the marked decline in wild-fruit gathering was due to the disappearance of forest vegetation in the far surroundings of the site. The woods may have been cleared to give way to arable fields and pasture land. Had *Physalis* occurred as a weed of cultivation in the Gomolava area (see Section 2: *Physalis*), its seeds should have been equally well present in Iron Age levels. *Sambucus nigra* shows a different picture: among the five occurrences of this species, four are from Iron Age samples. This is not really surprising as elder is not so much found in more or less natural woods but rather in waste places rich in nitrates.

4. THE VEGETATION

4.1. Forest vegetation

Information on the original forest vegetation in the Gomolava area is provided by the charred wood record presented in table 7. In addition, the pollen data obtained by Bottema (1975: table 7) for samples from occupation deposits of the tell contribute to the reconstruction of the vegetation in the vicinity of the site. Both sources of information have their limitations. Among the arboreal pollen, pine (*Pinus*) is predominant, although one may assume that in the period under consideration the tree did not occur in the surroundings of Gomolava (long-distance transport of pollen). The majority of the hand-picked wood samples included in table 7 was of timber used in the construction of houses and other buildings, implying a selection of wood for specific structural elements. This may explain the predominance of oak (*Quercus*) among the wood charcoal, although oak may, indeed, have been the most common tree of the upland forest. Thus, oak is relatively well represented in the pollen record. Except poplar (*Populus*), which is a typical river-valley species, the tree taxa represented by wood charcoal could all have formed part of the upland forest, although elm (*Ulmus*) and ash (*Fraxinus*) could have been found also in the riverine forest (see Section 1.2). Beech (*Fagus*) is absent from the charred wood record, although this tree forms part of the present forest vegetation of the Fruška Gora, which is the most likely match of the mixed deciduous forest inferred for the Gomolava area. One could argue that in Vinča times, beech had not yet reached the area, but this argument does certainly not hold for Iron Age times (cf. Huntley, 1988: p. 371).

In addition to the taxa represented by wood charcoal (table 7), a few more woodland species have been identified from Gomolava. Thus, *Solanum dulcamara* (bittersweet, listed in table 4), is found in swamp forest. Wild grape vine (*Vitis vinifera* ssp. *sylvestris*) occurs naturally in river-valley forest. The wild fruit taxa *Malus sylvestris* (crab apple) and *Cornus mas* (Cornelian cherry) formed part of the tree and shrub canopy of the upland forest. Like *Physalis alkekengi* (Chinese lantern) discussed in Sections 2 and 3.4, *Atropa belladonna* (deadly nightshade), a species with very poisonous black berries (table 2: VP12), may have been found particularly in forest clearings, and the same was probably true for wild strawberry (*Fragaria vesca*).

Neither the wood nor the pollen record provide conclusive evidence of deforestation in the Gomolava area. Juniper (*Juniperus*) wood in one of the La Tène samples could possibly point to forest destruction: this species may have expanded in forest clearings that were not (intensively) exploited by man. In addition, the wild-fruit record can be interpreted in terms of a substantial reduction of forest vegetation. As has been discussed in Section 3.4, wild-fruit gathering had declined seriously in Iron Age times, which is supposed to have been the result of the disappearance of woods from the area.

4.2. Herbaceous vegetation

An overview of the vegetation types other than forest inferred from the Gomolava plant record is presented in table 8. In this table, which shows the representation of herbaceous taxa in the various archaeological periods, the plant taxa are arranged according to ecological affinity. Such a grouping carries an element of arbitrariness with it, as the occurrence of some taxa may not be confined to the vegetation type under which it is listed here. Nevertheless the table provides a fair picture of the main types of vegetation established for the Gomolava area. Only taxa which could be attributed to a specific ecological group with a fair degree of certainty are included in table 8. As appears from this table, relatively few plant taxa are represented in more than 10% of the samples (in more than eight samples). It may be no surprise that by far the majority of the herbaceous plant taxa identified from Gomolava are found in disturbed habitats.

4.2.1. *Vegetation of arable fields*

Arable weeds must have entered the site together with the harvested crop, the latter probably in an unthreshed condition. Most common are both tall and climbing weeds, whereas low-growing weeds are much more scarcely represented in the seed record. This is no surprise as in sickle reaping the lower part of the straw and the low weeds will have been left on the field to be grazed afterwards. Among the *Bromus* (brome grass) species identified from Gomolava, *B. arvensis*, *B. secalinus* and *B. sterilis* are typical cornfield weeds and the same applies to the *Galium* (bedstraw) species *G. aparine*, *G. spurium* and *G. tricornutum*. *Agrostemma githago* (corn cockle), an ancient companion of plant cultivation, is well adapted to the 'struggle for life' as a weed of cornfields. It is a tall plant and its relatively large seeds are difficult to remove completely from the corn crop. It became a cosmopolitan weed which, however, has largely disappeared in the past century. The seeds are harmful to man as they can lead to flour poisoning, not seldom with serious consequences for the consumer.

Among the Vinča arable weeds, only *Polygonum convolvulus* (black bindweed) and *Vicia* (vetch), both climbing species, are comparatively well represented. One wonders whether this could indicate that in Vinča times, ear plucking was the usual harvesting

Table 8. Ecological affinity and sample frequencies of wild plant taxa (see Section 4.2). Numbers of herbaceous taxa include those not listed in the table.

	Vinča	Kostolac	Hallstatt	La Tène	Sum
Number of samples	39	10	7	28	84
Taxa of arable fields					
Polygonum convolvulus	15	4	7	16	42
Galium, various types	1	7	6	19	33
Vicia	8	5	2	12	27
Bromus, various types	1	3	4	11	19
Agrostemma githago	2	3	3	4	12
Weedy *Secale*	2	-	5	8	15
Echinochloa crus-galli	-	1	1	5	7
Digitaria cf. *sanguinalis*	-	1	2	1	4
Euphorbia helioscopia	1	-	-	4	5
Adonis	-	-	1	2	3
Phalaris	-	-	1	1	2
Stachys annua	-	-	-	2	2
Thlaspi arvense	-	-	1	-	1
Valerianella dentata	-	-	1	-	1
Convolvulus arvensis	-	-	-	1	1
Vaccaria pyramidata	-	-	-	1	1
Valerianella rimosa	-	-	-	1	1
Taxa of waste ground					
Chenopodium album	19	6	6	24	55
Sambucus ebulus	11	5	3	11	30
Chenopodium hybridum	1	1	4	20	26
Rumex, various types	3	2	2	7	14
Solanum nigrum	2	2	1	6	11
Polygonum aviculare	-	2	4	9	15
Malva	-	1	2	5	8
Plantago lanceolata	1	-	1	2	4
Nepeta	-	1	1	1	3
Polygonum lapathifolium	-	-	2	2	4
Hordeum, wild	-	-	1	1	2
Chenopodium polyspermum	1	-	-	-	1
Ballota nigra	-	1	-	-	1
Anchusa officinalis	-	-	-	1	1
Atriplex	-	-	-	1	1
Brassica nigra	-	-	-	1	1
Raphanus raphanistrum	-	-	-	1	1
Xanthium strumarium	-	-	-	1	1
Taxa of dry places					
Coronilla	-	1	2	-	3
Crucianella	-	-	-	3	3
Erodium	-	-	-	2	2
Ajuga chamaepitys	1	-	-	-	1
Ziziphora	-	-	1	-	1
Knautia arvensis	-	-	-	1	1
Taxa of damp places					
Carex	1	1	1	3	6
Scirpus sp.	-	2	2	14	18
Scirpus maritimus	-	1	2	10	13
Eleocharis	-	1	1	1	3
Sparganium	-	-	1	3	4
Water plants					
Trapa natans	2	-	-	-	2
Number of herbaceous taxa	24	29	42	56	

method. *Echinochloa* (cockspur grass) and *Digitaria* (finger-grass) occur both as weeds in millet fields. Their absence from the Vinča seed record may be related to the fact that in Vinča times, broomcorn millet still played a modest role in the Gomolava plant husbandry.

4.2.2. *Vegetation of waste ground*

Species of waste ground rich in nitrates must have been found in the settlement itself, e.g., on refuse heaps and in unused corners, as well as outside the settlement. One may assume that in the vicinity of the site weed vegetation could develop in waste places. Only a few species characteristic of ruderal habitats are (reasonably) well represented at Gomolava: the goosefoot species *Chenopodium album* and *Chenopodium hybridum*, *Sambucus ebulus* (dwarf elder), *Rumex* (sorrel), *Solanum nigrum* (black nightshade) and *Polygonum aviculare* (knotgrass). It is striking that of *Polygonum lapathifolium* (pale persicaria) only a few seeds and of *Atriplex* (orache) altogether one seed were retrieved, although these taxa are common constituents of the vegetation of waste, disturbed soil in the greater part of Europe. On the whole, the number of taxa of ruderal vegetation identified from Gomolava is rather small, and the same applies to the arable weeds. This may in part be due to the fact that seeds had been preserved almost exclusively in a charred state. Had conditions here been favourable for the preservation of plant remains in a waterlogged state, appreciably more taxa may have been identified.

The majority of the seeds of species of waste ground preserved in the occupation deposits may have been of strictly local origin, from plants growing on the site. In addition, some seeds may have originated from weed vegetation outside the settlement. Weeds of waste places were probably not gathered by man and brought to the site as animal fodder, but the animals themselves may have grazed on weed vegetation, after which seeds could have ended up in the settlement incorporated in the animal dung. Similarly, seeds of low-growing arable weeds may have found their way to the site in the digestive tract of animals. As for animal dung, it has been pointed out (Bottema, 1984; Miller & Smart, 1984) that this was commonly used for heating; it was either burned as such (droppings of sheep and goat) or made into so-called dung cakes (cattle dung). In fact, the use of dung fuel persists until the present day in areas with a scarcity of wood. The burning of dung may result in the charring of seeds incorporated in this kind of fuel, and, as a consequence, this practice may have contributed essentially to the charred seed contents of archaeological sites. One wonders whether there was any need to burn dung if plenty of firewood was available. This must have been the case in Vinča (and Kostolac?) times. In Iron Age times, on the other hand, the surroundings of Gomolava may largely have been depleted of woods, which made the use of animal dung for heating more attractive if not necessary. Could this explain the greater number of weed taxa established for Iron Age Gomolava? As an alternative explanation one should keep in mind that all over Europe the number of synanthropic species (species of man-induced habitats) had increased quite considerably in the course of time, due to the continuous immigration and spread of new species. Also at Gomolava, the Iron Age weed flora must have been richer in species than that of the Vinča and Kostolac periods.

4.2.3. *Vegetation of dry places*

A modest number of taxa are thought to have occurred in (comparatively) dry places that were not under cultivation. One could think here of man-made habitats, such as roadsides, field-boundary ridges and, possibly, the talus of the tell. In flora works, the taxa listed under this group are reported from dry grassy places and dry open habitats. It could not be determined whether *Teucrium* (germander) formed part of the vegetation of dry places (*T. chamaedrys*) or of that of moist habitats (*T. scordium*): see Section 2: *Teucrium*.

4.2.4. *Vegetation of damp places*

Marsh vegetation in the river valley is represented by a few species. Sedge (*Carex*) and clubrush (*Scirpus*) species could have been used as litter for bedding, and sea clubrush (*Scirpus maritimus*) also for matting and basket making. Reed, which could have been used for thatching roofs, is absent from the archaeobotanical record. The valley vegetation may have been exploited also as grazing land.

5. REFERENCES

BOROJEVIĆ, K., 1988a. Analyses of carbonised seeds from the La Tène period on the Gomolava site. In: B. Jovanović & M. Jovanović (eds), *Gomolava, naselje mladjeg gvozdenog doba*. Novi Sad, Vojvodanski Musej/Beograd, Archeološki Institut, pp. 111–117 (Serbo-croatian with English summary).

BOROJEVIĆ, K., 1988b. Differences in plant macro remains from the Neolithic level at Gomolava and the Neolithic site of Opovo. In: N. Tasić & J. Petrović (eds), *Gomolava. Chronologie und Stratigraphie der vorgeschichtlichen und antiken Kulturen der Donauniederung und Südosteuropas*. Novi Sad, Vojvodanski Musej, pp. 109–115.

BOTTEMA, S., 1975. The interpretation of pollen spectra from prehistoric settlements (with special attention to Liguliflorae). *Palaeohistoria* 17, pp. 17–35.

BOTTEMA, S., 1984. The composition of modern charred seed assemblages. In: W. van Zeist & W.A. Casparie (eds), *Plants and ancient man*. Rotterdam/Boston, A.A. Balkema, pp. 207–212.

BOTTEMA, S. & B.S. OTTAWAY, 1982. Botanical, malacological and archaeological zonation of settlement deposits at Gomolava. *Journal of Archaeological Science* 9, pp. 221–246.

BRUKNER, B., 1965. Neolithic and early Eneolithic layers at Gomolava. *Rad Vojvodjanskih Muzeja* 14, pp. 137–175 (Serbo-croatian with English summary).

BRUKNER, B., 1971. Gomolava à Hrtkovci, site préhistorique à plusieurs couches. In: G. Novak (ed.), *Epoque préhistorique et protohistorique en Yougoslavie. Recherches et résultats*. Beograd, Société Archéologique de Yougoslavie, pp. 175–176.

BRUKNER, B., 1988. Die Siedlung der Vinča-Gruppe auf Gomolava (die Wohnschicht des Spätneolithikums und Frühäneolithikums (Gomolava Ia, Gomolava Ia-b und Gomolava Ib) und der Wohnhorizont des äneolithischen Humus (Gomolava II). In: N. Tasić & J. Petrović (eds), *Gomolava. Chronologie und Stratigraphie der vorgeschichtlichen und antiken Kulturen der Donauniederung und Südosteuropas*. Novi Sad, Vojvodanski Musej, pp. 19–38.

ĆOLOVIĆ, S., 1956. Flora von Fruška Gora und Umgebung. *Rad Vojvodjanskih Muzeja* 5, pp. 113–131 (Serbo-croatian with German summary).

EGGINK, J.W., 1983. The molluscs of the dwelling mound Gomolava, Yugoslavia. An environmental investigation on and near Gomolava. *Palaeohistoria* 25, pp. 55–76.

GIRIĆ, M., 1988. Geschichte der archäologischen Ausgrabungen auf Gomolava. In: N. Tasić & J. Petrović (eds), *Gomolava. Chronologie und Stratigraphie der vorgeschichtlichen und antiken Kulturen der Donauniederung und Südosteuropas*. Novi Sad, Vojvodanski Musej, pp. 13–17.

HEDRICK, U.P. (ed.), 1972. *Sturtevant's edible plants of the world*. Dover Publications, New York.

HEGI, G., 1927. *Illustrierte Flora von Mitteleuropa*, Band V4. München, Carl Hansen Verlag (Nachdruck 1964).

HUNTLEY, B., 1988. Europe. In: B. Huntley & T. Webb III (eds.), *Vegetation history*. Dordrecht/Boston/London, Kluwer Academic Publishers, pp. 341–383.

JOVANOVIĆ, B., 1988. Die Stratigraphie der Latène-Siedlung auf Gomolava. In: N. Tasić & J. Petrović (eds), *Gomolava. Chronologie und Stratigraphie der vorgeschichtlichen und antiken Kulturen der Donauniederung und Südosteuropas*. Novi Sad, Vojvodanski Musej, pp. 65–70.

KNÖRZER, K.-H., 1971. Eisenzeitliche Pflanzenfunde im Rheinland. *Bonner Jahrbücher* 171, pp. 40–58.

KÖRBER-GROHNE, U., 1991. Bestimmungsschlüssel für subfossile Gramineen-Früchte. *Probleme der Küstenforschung im südlichen Nordseegebiet* 18, pp. 169–234.

KROLL, H.J., 1983. *Kastanas. Ausgrabungen in einem Siedlungshügel der Bronze- und Eisenzeit Makedoniens 1975-1979. Die Pflanzenfunde*. Verlag Volker Spiess, Berlin.

KUČAN, D., 1995. Zur Ernährung und dem Gebrauch von Pflanzen im Heraion von Samos im 7. Jahrhundert v.Chr. *Jahrbuch des Deutschen Archäologischen Instituts* 110, pp. 1–64.

MILLER, N.F. & T.L. SMART, 1984. Intentional burning of dung as fuel: a mechanism for the incorporation of charred seeds into the archaeological record. *Journal of Ethnobiology* 2, pp. 15–28.

PETROVIĆ, J., 1988. Enéolitique moyen et tardif à Gomolava. In: N. Tasić & J. Petrović (eds), *Gomolava. Chronologie und Stratigraphie der vorgeschichtlichen und antiken Kulturen der Donauniederung und Südosteuropas*. Novi Sad, Vojvodanski Musej, pp. 39–46.

TASIĆ, N., 1988. Bronze- und ältere Eisenzeit auf Gomolava. In: N. Tasić & J. Petrović (eds), *Gomolava. Chronologie und Stratigraphie der vorgeschichtlichen und antiken Kulturen der Donauniederung und Südosteuropas*. Novi Sad, Vojvodanski Musej, pp. 47–58.

WATERBOLK, H.T., 1988. C^{14}-Datierungen von Gomolava. In: N. Tasić & J. Petrović (eds), *Gomolava. Chronologie und Stratigraphie der vorgeschichtlichen und antiken Kulturen der Donauniederung und Südosteuropas*. Novi Sad, Vojvodanski Musej, pp. 117–121.

ZEIST, W. VAN, 1975. Preliminary report on the botany of Gomolava. *Journal of Archaeological Science* 2, pp. 315–325.

ZEIST, W. VAN & J.A.H. BAKKER-HEERES, 1982. Archaeobotanical studies in the Levant. I. Neolithic sites in the Damascus basin: Aswad, Ghoraifé, Ramad. *Palaeohistoria* 24, pp. 165–256.