PLANT HUSBANDRY IN EARLY NEOLITHIC NEA NIKOMEDEIA, GREECE

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SUMMARY

For the early Neolithic site of Nea Nikomedeia in northern Greece (ca. 5470 B.C.) the following plant species could be established: *Triticum monococcum, Triticum dicoccum, Hordeum vulgare* var. *nudum, Lens culinaris, Pisum sativum, Vicia ervilia, Quercus* sp., *Cornus mas*, and *Prunus* cf. *spinosa.*

1. INTRODUCTION

The Neolithic site of Nea Nikomedeia is situated in northern Greece, on the southwestern edge of the Plain of Macedon, about 60 km west of Thessaloniki (*fig. 1*). Excavations were carried out under the direction of Professor Robert J. Rodden (Department of Anthropology, University of California, Berkeley) in 1961 and 1963 (RODDEN 1962, 1964, 1965). In the low settlement mound, which covers an area of about 220 by 110 m, early and late Neolithic levels could be established. In the early Neolithic level, in addition to stone objects and to large numbers of pottery sherds and animal bone fragments, foundations of rectangular buildings were found. Three radiocarbon determinations are available for the early Neolithic level: 6230 ± 150 B.C. (Q-655), 5605 ± 90 B.C. (P-1202), 5330 ± 75 B.C. (P-1203) (GODWIN & WILLIS 1962, STUCKENRATH 1967). Comparison with radiocarbon dates for other early Neolithic sites in southeastern Europe and southwestern Asia suggests that the date of 6230 B.C. is too early and that an age of about 5470 B.C. is much more likely.

During the 1963 campaign fairly large numbers of carbonized seeds were recovered from the early Neolithic level. The seeds did not occur in large quantities in vessels or storage pits, but were dispersed in the cultural debris in varying concentrations. No flotation in water has been applied, but the seeds were picked up from the exposed surface or from a pit when they were observed with the naked eye. In spite of careful sampling small seeds and plant remains such as spikelet forks and rachis internodes may have escaped recovery.

The results of the seed analysis are shown in *table 1*. A few seeds for which even the family could not be determined are not included in this table. Since the final excavation report with the detailed settlement plans has not yet appeared, the location of the samples with reference to the grid system of the excavated area or with reference to architectural features is not given here. As for the measurements, since on most cereal grains the radicle point had not been preserved, this is not included in the length if present.

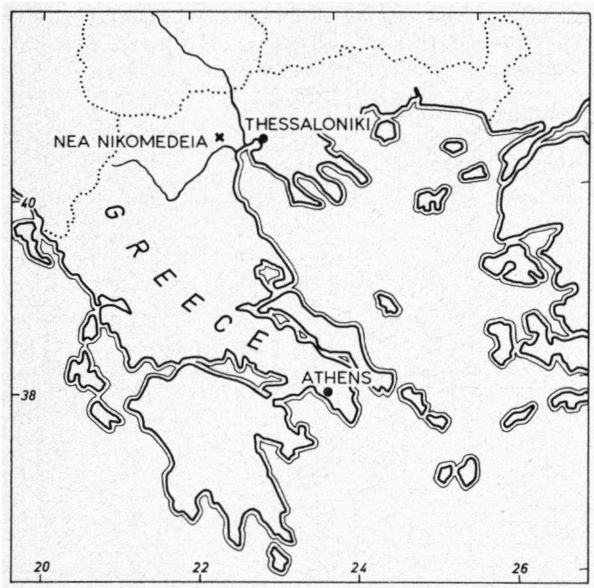

Fig. 1. Map of Greece showing the location of Nea Nikomedeia.

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2. EMMER WHEAT (*Triticum dicoccum* Schübl.)

Emmer wheat is present in many samples, and not infrequently in fairly large numbers. One spikelet base was recovered (sample 8). The preservation varies considerably; well preserved specimens do occur, but many emmer grains have suffered more or less seriously from their carbonization.

In *Triticum dicoccum* (*figs. 2* and *3*) the grain tapers towards the upper and lower end, showing its greatest width in the middle of the kernel. The ends are more or less blunt. The ventral side is flat, and longitudinally straight or somewhat concave. The dorsal side is curved. A rather blunt dorsal ridge could be observed in many grains, but fairly often this ridge is not present, and then the dorsal side is more or less evenly rounded in cross-section.

From 4 samples (19, 22, 23, 26) grains were measured. As only rather small numbers of kernels turned out to be suitable for measuring the results are not shown separately for each sample, but for the total of all measured grains (*table 2, fig. 4*).

As is clear from the L:B index values the emmer grains from Nea Nikomedeia show a fairly large variation in shape. Plump as well as outspokenly slender kernels are present (*fig. 3*). This variation is nothing particular, since it is found in most carbonized emmer recovered from prehistoric sites.

Table 1. Numbers of charred seeds from various locations in the early Neolithic level of Nea Nikomedeia. Grains from one-seeded *Triticum dicoccum* spikelets are given between brackets. Cereal grain fragments: + few, ++ fairly many, +++ many.

Sample number	Triticum monococcum	Triticum dicoccum	Hordeum vulgare nudum	Cereal grain fragments	Gramineae indet.	Lens culinaris	Pisum sativum	Vicia ervilia	Leguminosae indet.	Quercus	Cornus mas	Prunus cf. spinosa
1	-	-	-	-	-	-	-	-	-	-	1	-
3	-	-	-	-	-	-	-	-	-	-	1	-
4	½	217	8	++	-	9	19	-	-	-	-	-
5	-	29	8	+	-	-	4½	-	-	-	-	-
6	-	-	½	-	-	-	-	-	-	-	-	-
7	258	13	-	-	-	5	-	-	-	-	-	-
8	-	179	-	++	1	3	-	-	-	-	fragm.	-
9	2	9	-	+	-	-	-	-	-	-	-	-
10	-	2½	-	-	-	-	-	1	-	-	-	-
12	-	1	1	-	-	-	-	-	-	-	-	-
13	1	4	2	-	-	1	1	-	-	-	1	-
14	2	126	16	+	-	73	-	2	-	-	-	-
16	-	63	8½	+	-	15	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	fragm.
18	-	56	39	+	-	114	1	-	-	-	-	-
19	5	494(3)	761	+++	-	677	4	2	-	-	-	-
20	-	7	48	+	-	80	-	-	-	1/3	-	-
21	-	37	40	+	-	212	-	-	1	-	-	-
22	4	651(8)	398	+	-	622	6	3	1	-	-	-
23	2	408(3)	572	+++	-	1410	6	8½	1	½	-	-
24	-	28	20	+	-	186	4	6	-	-	-	-
25	-	44	21	+	-	166	-	-	-	-	-	-
26	-	409	200	+	-	1378	-	10	-	-	-	-
27	1	81(2)	24	+	-	480	3	4	-	8	-	-
28	-	-	-	-	-	-	-	-	-	½	-	-
29	-	-	1	-	-	-	-	-	-	-	-	-

Table 2. Dimensions in mm and indices for *Triticum dicoccum* (N = 242).

	Length	Breadth	Thickness	L:B	T:B
minimum	4.5	2.2	1.8	144	69
average	5.47	2.92	2.57	189	88
maximum	6.4	3.6	3.0	238	115

Fig. 2. Emmer wheat

A few drop-shaped emmer grains were met with (samples 4, 5, 13, 16). This type shows its greatest breadth in the upper part of the grain (*fig. 3*). This shape must have been effected by the carbonization. In this connection it should be mentioned that in emmer spikelets the basal part of the glumes is very sturdy. If during carbonization the grains remain enclosed by the glumes the lower end of the seeds cannot expand, this in contrast to the upper end. The spikelet bases show a tendency to decrease in width in carbonization. It should be stressed that this explanation for the origin of drop-shaped carbonized emmer seeds is only a hypothesis.

Grains which are supposed to have developed in one-seeded emmer spikelets will be discussed on p. 531.

3. EINKORN WHEAT (*Triticum monococcum* L.)

The larger part of sample 7 consists of *Triticum monococcum*. Most einkorn grains show no serious deformations in consequence of their carbonization. The

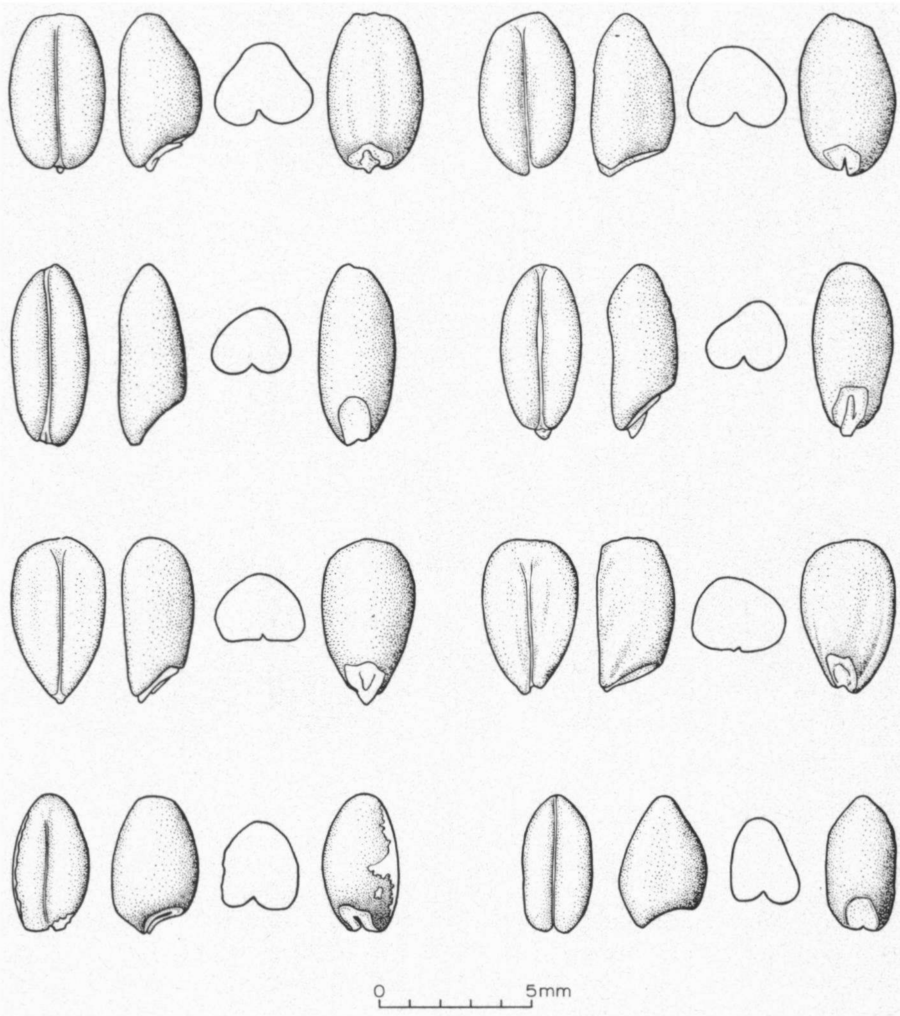

Fig. 3. *Triticum dicoccum.* Row 1: plump grains; row 2: slender grains; row 3: drop-shaped grains; row 4: grains from one-seeded spikelets.

seeds are laterally compressed. The ventral as well as the dorsal side are longitudinally curved, and the grains are pointed at both ends. The ventral furrow is narrow, while the dorsal side has a fairly sharp ridge (*figs. 5* and *6*).

The results of the measurements are shown in *table 3* and *fig. 7*. It is characteristic of einkorn that as a rule the seeds are thicker than broad, which finds expression in T:B indices of more than 100.

In *Triticum monococcum* spikelets usually one seed develops, but two-seeded spikelets do occur. The ventral side of einkorn grains from two-seeded spikelets

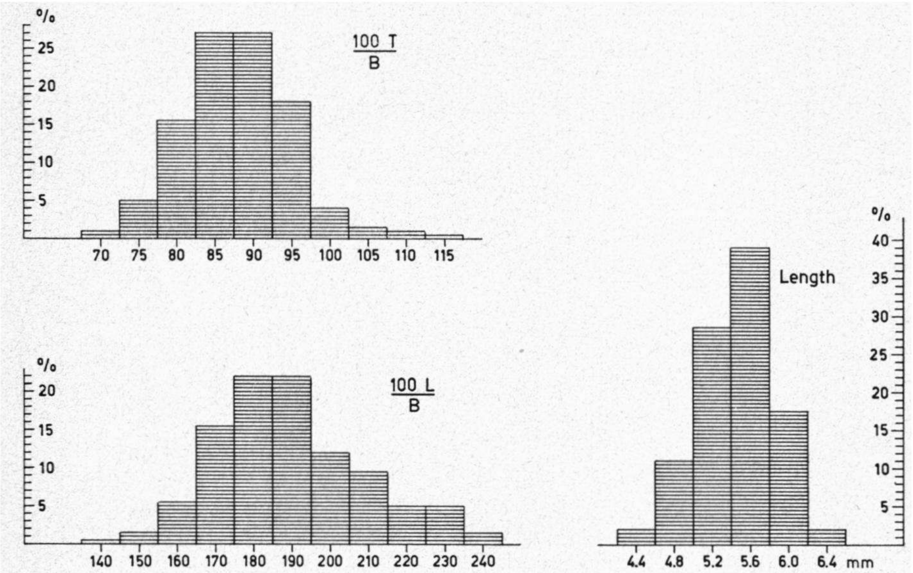

Fig. 4. Frequency distribution histograms for *Triticum dicoccum* (N = 242).

Fig. 5. Einkorn wheat.

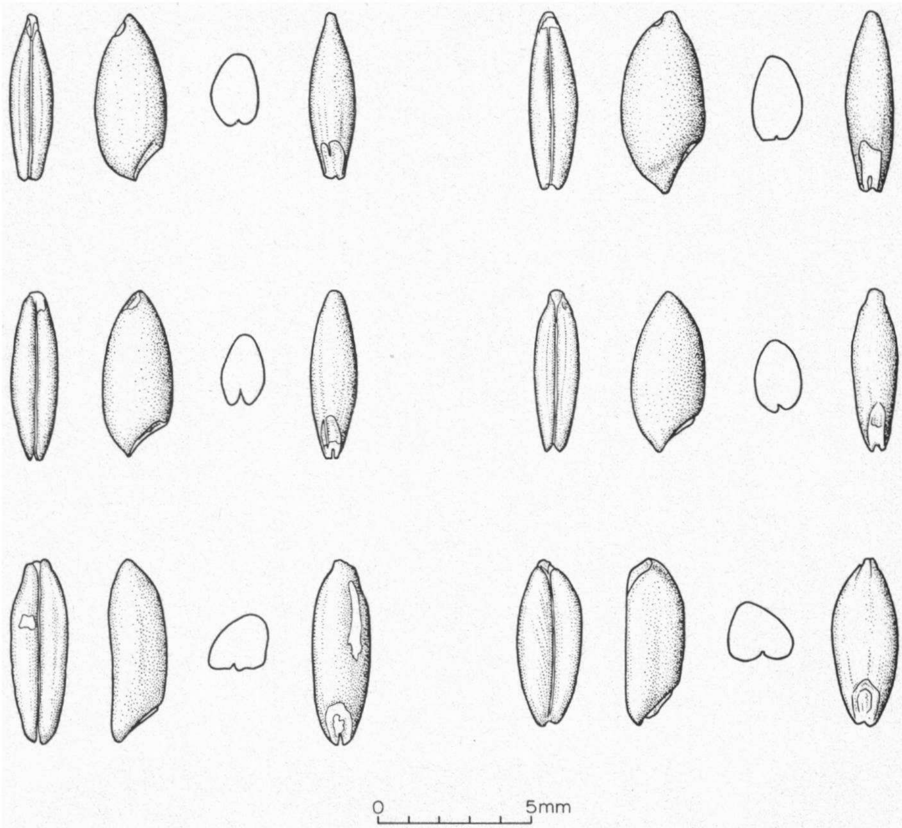

Fig. 6. *Triticum monococcum.* Upper and middle row: grains from one-seeded spikelets; lower row: grains from two-seeded spikelets.

Table 3. Dimensions in mm and indices for *Triticum monococcum* from sample 7 (N = 97).

	Length	Breadth	Thickness	L:B	T:B
minimum	4.8	1.3	2.0	246	110
average	5.67	1.86	2.45	307	133
maximum	6.6	2.4	2.8	400	172

is not curved but straight and flat. They can be distinguished from emmer grains by the fact that they are more slender and that both ends are pointed.

Six grains from sample 7 have been identified as those from two-seeded einkorn. In contrast to those from one-seeded spikelets, the grains from two-seeded einkorn spikelets are generally broader than thick (*table 4*).

Table 4. Dimensions in mm and indices for einkorn grains from two-seeded spikelets (N = 5).

	Length	Breadth	Thickness	L:B	T:B
minimum	5.2	1.7	1.6	255	81
average	5.5	2.0	1.8	271	89
maximum	6.0	2.2	2.2	306	100

Small numbers of einkorn-type grains were found in other samples. Stray einkorn-type grains which occur together with larger numbers of *Triticum dicoccum* can constitute a problem. Are they really einkorn, or must they be considered as kernels from one-seeded emmer spikelets, as is suggested by TEMPIR (1964)? In this connection it must be mentioned that among the stray grains mentioned above two types can be distinguished, viz. a slender type which compares well with the einkorn from sample 7 and a plumper type. The latter type is blunt on both ends and its dorsal side is not sharply ridged, but more rounded.

From the modern emmer material present in the reference collection of the Biologisch-Archaeologisch Instituut, one-seeded spikelets which are mostly found in the top of the ear were dehusked. It was somewhat surprising to learn that most grains from one-seeded emmer spikelets do not resemble einkorn, but that they look like ordinary, slender emmer kernels. Only a few show a longi-

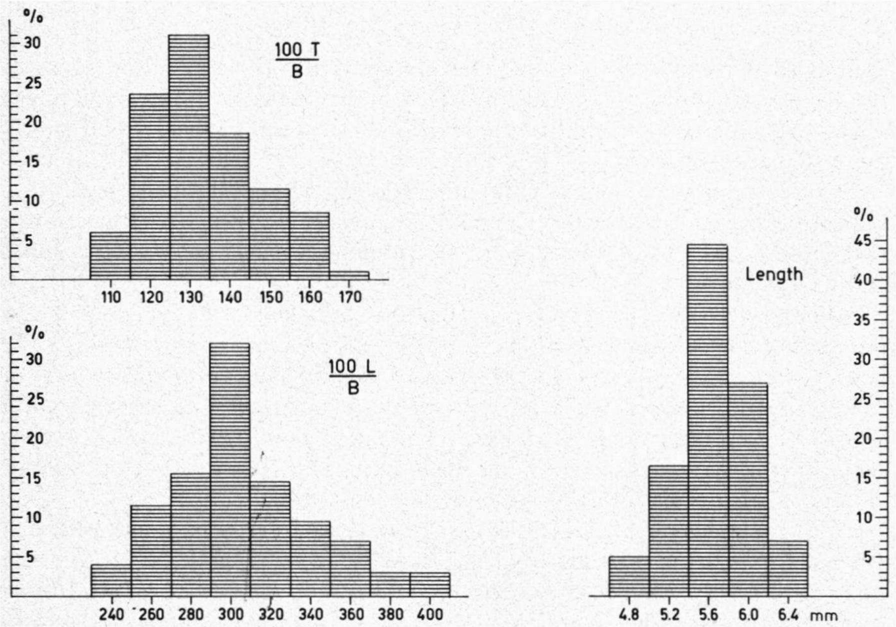

Fig. 7. Frequency distribution histograms for *Triticum monococcum* (N = 97).

tudinally curved ventral side and remind one of einkorn. However, these grains can be distinguished from einkorn by the more or less blunt upper and lower end and by the emmer-like dorsal side.

The slender ones among the Nea Nikomedeia stray einkorn-type grains are attributed to *Triticum monococcum*. In four samples a few grains were found which are considered to have been formed in one-seeded emmer spikelets (*fig. 3*). In *table 1* these specimens are shown between brackets. The dimensions and indices for 13 grains of this type are given in *table 5*.

Table 5. Dimensions in mm and indices for emmer grains from one-seeded spikelets (N= 13).

	Length	Breadth	Thickness	L:B	T:B
minimum	4.6	2.0	2.3	182	104
average	4.9	2.3	2.7	217	118
maximum	5.7	2.6	3.0	284	127

The fact that by far the larger part of sample 7 consists of einkorn demonstrates that this wheat species was grown intentionally by the Nea Nikomedeia farmers and that it did not occur only as an admixture in other cereal crops.

4. NAKED SIX-ROW BARLEY (*Hordeum vulgare* L. var. *nudum*)

Among the Nea Nikomedeia seeds, barley (*figs. 8* and *9*) is quite numerous. As for the preservation, rather well preserved grains occur as well as specimens which had suffered so much from puffing and corrosion that they could hardly be recognized as barley.

The dorsal and the ventral side are about equally curved. The grains are broader than they are thick, while both the breadth and the thickness show a maximum in the middle of the grain, decreasing gradually towards the upper and lower end.

All fairly well preserved grains were identified as naked barley, suggesting that the barley from this site is exclusively of this variety. The fine transverse wrinkling on the surface which is characteristic of naked barley is present in only a small number of seeds. Especially among the better preserved grains slightly lopsided specimens could be observed, indicating that six-row barley is concerned here. As no rachis internodes have been recovered it is not possible to determine whether it is the lax-eared or the dense-eared form.

From 5 samples (19, 21, 22, 23, 26) grains were measured, the results of which are again shown for the total of all measured specimens (*table 6*, *fig. 10*). The carbonized barley grains show a fairly large variation in size and shape. In this connection it should be taken into consideration that naked barley is generally more seriously affected by carbonization than other cereals.

Fig. 8. Naked barley.

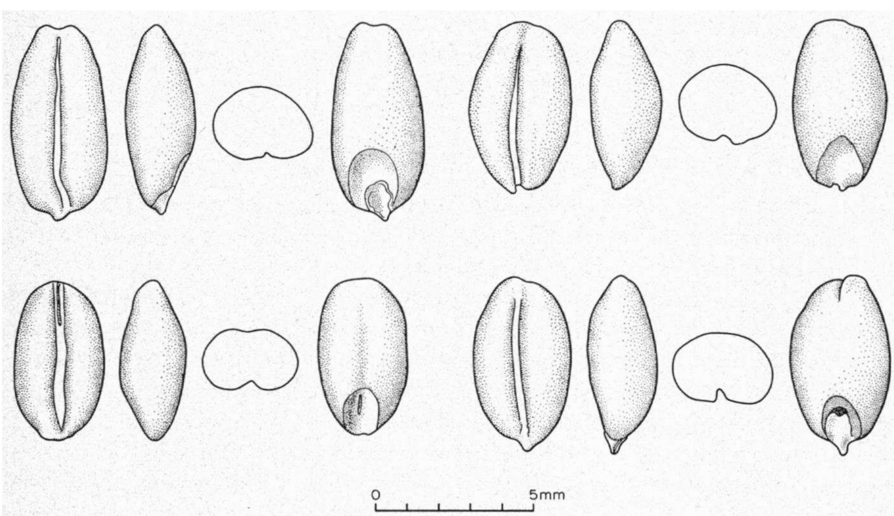

Fig. 9. *Hordeum vulgare* var. *nudum*.

Table 6. Dimensions in mm and indices for *Hordeum vulgare* var. *nudum* (N = 244).

	Length	Breadth	Thickness	L:B	T:B
minimum	4.2	2.2	1.6	124	56
average	5.57	3.13	2.31	179	74
maximum	7.0	3.8	3.0	254	93

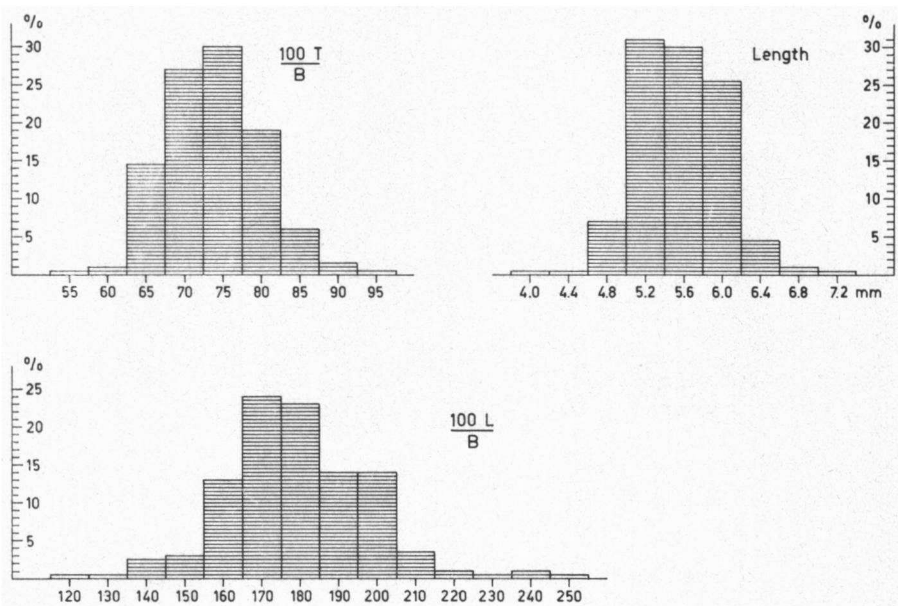

Fig. 10. Frequency distribution histograms for *Hordeum vulgare* var. *nudum* (N = 244).

5. LENTIL (*Lens culinaris* Medik.)

The circular seeds are bi-convex with a fairly sharp edge, on which the small, oblong hilum and the radicle are situated. The preservation of the larger portion of the carbonized lentils from Nea Nikomedeia is rather good.

Lentils are present in many samples, in a few cases even in large quantities (samples 19, 22, 23, 26). For a large number of lentils the greatest diameter was determined. From *table 7*, which shows the results for the samples for which more than 100 seeds were measured, it is clear that between the various samples there are no significant differences in size. The histogram of *fig. 11* shows the size frequency distribution for all measured lentils (2268 specimens). The average size amounts to 3.17 mm. The diameter of a good 93% of the seeds varies from 2.6 to 3.8 mm, and the minimum and maximum diameters are 1.9 and 4.6 mm respectively.

Table 7. Greatest dimension in mm of *Lens culinaris* in samples for which more than 100 specimens were measured.

sample number	minimum	average	maximum
18 (N = 110)	2.6	3.14	3.9
19 (N = 413)	1.9	3.21	4.6
22 (N = 256)	2.2	3.08	4.1
23 (N = 200)	2.3	3.21	4.1
24 (N = 184)	2.4	3.16	4.1
25 (N = 168)	2.5	3.22	4.2
26 (N = 469)	2.4	3.21	4.2
27 (N = 241)	2.2	3.10	4.1

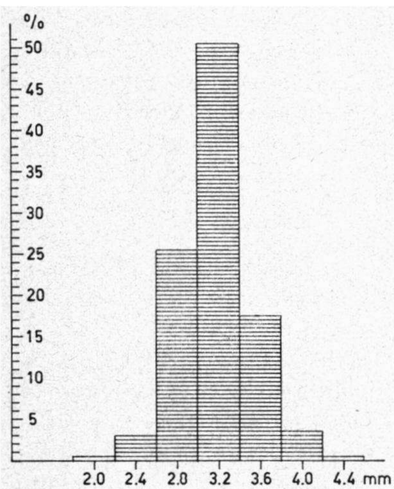

Fig. 11. Frequency distribution histogram for the diameter of *Lens culinaris* (N = 2268).

The Nea Nikomedeia lentils belong to the small-seeded variety, *Lens culinaris* Medik. var. *microsperma* (Baumg.) Barulina, as is the case with all lentils from prehistoric sites. From the large numbers of lentils recovered in Nea Nikomedeia it may be concluded that this crop constituted an important food.

6. PEA (*Pisum sativum* L.)

The peas found in the Nea Nikomedeia samples do not show a uniform shape. Globular specimens occur as well as those with one or two flat sides. Most of the peas are rather well preserved. The radicle and the hilum had mostly fallen off, leaving conspicuous depressions.

In all, 35 specimens were suitable for measuring (*table 8*). If a more or less flat side was present the length and the breadth were taken over this plane. The thickness represents the distance between the flat side and the opposite end. In case of more or less spherical seeds the location of these measurements was chosen somewhat arbitrarily.

Table 8. Dimensions in mm for *Pisum sativum* (N = 35).

	Length	Breadth	Thickness
minimum	2.7	2.6	2.7
average	3.55	3.37	3.25
maximum	4.6	4.3	4.0

As for the size, the Nea Nikomedeia peas fall within in the range of *Pisum elatius* DC. (3–5 mm) which is considered to be the wild progenitor of the cultivated pea (cf. HEGI 1924, p.1613). However, the absence of fine warts, characteristic of the seeds of *Pisum elatius*, points to *Pisum sativum*. Moreover, the size of the Nea Nikomedeia peas matches that for those from Neolithic sites in Central Europe (cf. TEMPIR 1964), outside the distribution area of the wild pea.

7. BITTER VETCH (*Vicia ervilia* (L.) Willd.)

The angular-rounded seeds of *Vicia ervilia* are four-sided. For 29 seeds the greatest diameter was determined: minimum, average and maximum values are 2.5, 2.91 and 3.4 mm respectively.

From the fairly small numbers of bitter vetch seeds met with in the Nea Nikomedeia samples it is not clear whether this species was grown intentionally or whether it occurred only as a weed, particularly in lentil fields. For various archaeological sites more or less pure bitter vetch samples are reported, suggesting that this legume was cultivated. At Çatal Hüyük a large quantity of bitter vetch seeds was recovered from a level which is dated to about 5750 B.C. (HELBAEK 1964). Consequently, it may be justified to assume that bitter vetch was a crop plant of the Nea Nikomedeia farmers.

At present *Vicia ervilia* is cultivated as fodder. The circumstance that in archaeological sites it has been found together with human food suggests that in earlier times man himself consumed these seeds.

The seeds of bitter vetch are poisonous for man and some animals (HEGI 1924, pp. 1513–4). The poisonous substance can be removed by boiling the seeds and pouring off the water.

8. OAK (*Quercus* L.)

In addition to carbonized acorn fragments, one complete fruit and two halves were found (26.5 × 14.5, 20.4 × 12.8, 27.2 × 16.5 mm).

It is likely that the acorns were collected for human consumption. In addition to starch, they contain a fairly high content of fat. According to HELBAEK (1964) the bitter taste of the acorns could be removed by boiling or roasting.

9. DOGWOOD (*Cornus mas* L.)

Cornus mas is represented with three fruit stones and one fragment. The stones of dogwood fruits are oblong. A narrow scar which crosses the lower end runs on both sides over 1/4 to 1/3 of the length of the stone. Four low, longitudinal ribs stretch from the upper end, disappearing in the lower part of the stone. Sometimes these ribs are hardly visible.

Of the three carbonized dogwood fruit stones two are well preserved, whereas a third one is rather seriously damaged (11.1 × 6.6, 11.6 × 6.6,? 11.9 × 5.8 mm). In all three stones the narrow scar over the lower end is, at least partly, visible. Only on one fruit stone could a few inconspicuous ribs be observed.

Today the fruits of *Cornus mas* are still collected in order to make marmalade, juice and compote.

10. CONCLUSION

Emmer wheat and naked barley were the most important cereal crops grown by the Nea Nikomedeia farmers. Einkorn wheat was also cultivated, but economically it was of less importance. Lentils were found in large numbers suggesting that this pulse played an important part in the diet of the inhabitants of the site. In addition to lentil, pea and bitter vetch were grown.

Bread wheat (*Triticum aestivum* L.) which is found in Çatal Hüyük (ca. 5750–5600 B.C.) and Hacilar (ca. 5500 B.C.), both in southwestern Turkey (HELBAEK 1964, 1966), could not be established for Nea Nikomedeia. It should be mentioned that emmer seeds occur which by their plumpness and rather flat dorsal side remind one of *Triticum aestivum*. In spite of the superficial resemblance, the grains concerned have been attributed to emmer wheat. The greatest width of these bread wheat-type grains is not in the lower part of the kernel but in the middle. It is true that not all *Triticum aestivum* grains show their greatest width in the lower part of the seed, but most of them do. If bread wheat grains were present in the Nea Nikomedeia samples it would be justified to expect kernels with the greatest width near the embryo end. However, all plump wheat grains from Nea Nikomedeia which had not obviously been deformed have their greatest width in the middle.

Hulled barley which is reported for some early Neolithic sites in Greece and southwestern Asia (cf. RENFREW 1969) is not represented in the Nea Nikomedeia material.

In addition to the cultivation of plants, the collecting of wild fruits and seeds played a part in the economy, as is demonstrated by the presence of acorns and of fruit stones of *Cornus mas* and *Prunus* cf. *spinosa*.

It is striking that practically no weeds were found. This may partly be due to the way the carbonized material was recovered during the excavation, in consequence of which small seeds may have escaped collection. On the other hand, larger seeds, such as of *Galium* and *Polygonum*, would certainly have been recovered if they had been present in some quantities. It is not likely that at that time the fields were nearly free of weeds. The near absence of seeds of weeds must be ascribed to the way of harvesting, viz. to the practice of cutting each are separately or pulling out each plant separately.

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