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QUEEN ICHETIS' WHEAT

A CONTRIBUTION TO THE STUDY OF EARLY DYNASTIC EMMER OF EGYPT

BY

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The staple wheat species of Egypt, from the dawn of agriculture in the Nile valley till the day of the Roman hegemony, was Emmer, *Triticum dicoccum* Schübl. This cereal is believed to be derived from the wild *T. dicoccoides* Koern., which is distributed from the Syro-Palestinian coastal mountains to the foothills of Iraq and Iran.

For a long time Egyptian culture was considered the earliest bearer of agriculture, and consequently Emmer was believed to have emerged as a cultivated plant in Egypt or in the mountainous area of Abyssinia.[1] When in the nineteen-twenties the Russian plant geographer, Vavilov, mapped out the distribution of plants, wild and cultivated, of the western Asiatic and eastern African regions, he discovered a conspicuous concentration of varieties of Emmer in Abyssinia. He was convinced that the place in which a cultivated plant occurs in the greatest diversity should be considered the place of emergence of the species or, in other words, the place where the first experiments in its domestication had taken place. Indeed he recognized the necessity of the presence of the wild progenitor in any postulated place of emergence, but as *T. dicoccoides* does not exist in Abyssinia today he rejected the idea of its paternity to Emmer and suggested some unknown, now extinct, species in its place.[2]

Since then archaeological investigations of Mesopotamia and adjacent areas have disclosed above doubt that agriculture was performed in these parts of the Middle East long before the earliest agricultural settlements were active in Egypt,[3] and furthermore, it has been shown that the earliest Emmer in these regions is of a more primitive type, resembling *T. dicoccoides* more closely than even the earliest Egyptian wheat.[4]

In consequence of Vavilov's discoveries and subsequent theories as to agricultural diffusion in the Early Neolithic it was believed that the cultivation of Emmer had started in Abyssinia or Upper Egypt and from there spread along the Nile and the eastern Mediterranean to Mesopotamia in the east and to Anatolia, and eventually Europe, in the west.[5]

Based upon the more recent archaeological and botanical discoveries this concept is at the moment given up in preference of the belief that the progenitor is actually *T. dicoccoides*; that the place where this plant was originally subjected to cultivation was the area mentioned above, where *T. dicoccoides* grows wild to-day; and, consequently, that the dispersion of its cultivation had the general direction from north to south, as far as Egypt is concerned,[6] contrary to the concept maintained by Vavilov as well as earlier investigators.

As long as Emmer was believed to have performed the migration from the south towards the north there was no special reason for expecting plants distributionally confined to regions north of Egypt, to have grown together with Emmer in that country. But with the change of viewpoints new possibilities became apparent. Thus, for instance, it became theoretically reasonable to expect Eincorn (*T. monococcum* L.) among the Egyptian grain deposits. This species is believed to have developed by cultivation of the wild *T. Aegilopoides* Bal. which is distributed in much the same places as is *T. dicoccoides*, and further in Anatolia and the Balkans. Now its occurrence in the Emmer fields of the Nile valley seemed theoretically possible, as the two wild species occur together in certain localities, and their two cultivated descendants have been established in the same finds of early prehistoric grain from Iraq,[6] Syria,[6] Anatolia[7] and Europe.[8] As the Egyptian Emmer must originate in, or have passed through areas where Eincorn was a component of the Emmer field, it was a warrantable assumption that Eincorn might have been introduced into Egypt together with Emmer.

But Eincorn was never established in the large deposits of prehistoric and Early Dynastic Emmer of Egypt, investigated by outstanding morphologists as, for instance, Georg Schweinfurth, who was especially well acquainted with the early plant material from that country. And up to quite recently all literature dealing with these matters offered the statement that Eincorn was perfectly unknown to the Egyptian-Semitic area, a conviction that seemed to be shared by all plant breeding archaeologists and geneticists.[9]

Thus when in 1948 and 1950 reports appeared recording the discovery of Eincorn in the Neolithic site at Omari,[10] and in the burial deposit of the Third Dynasty grave of the Pharaoh Zozer in the Saqqarah Pyramid near Memphis,[11] dated at about 2900 B.C., it meant a complete break with long-established conceptions. For this reason the excavator, Jean-Philippe Lauer, and the Botany Department of Fuad I University in Cairo, represented by Vivi Laurent Täckholm, considered it desirable to have a thorough investigation made when next the opportunity arose.

This happened in 1950 when during his excavation of Queen Ichetis' tomb in the Saqqarah Pyramid J.-P. Lauer discovered a new grain deposit of exactly the same nature as the earlier Saqqarah find, the Zozer deposit. In order to obtain an opinion independent of that of the previous investigators, and reached by application of the methods especially used by the plant husbandry archaeologist, the present writer was entrusted with the interesting work of examining and describing the mummified wheat from the Sixth Dynasty tomb of Queen Ichetis, approximately 4500 years old.

The sample submitted for examination consists of two whole spikes and 26 major portions of such.[12] It is of the usual brown colour and not especially fragile. Some of the fragments are top portions, others bottom portions of the spike. Obviously they were all awned originally, and in some of the specimens portions of very sturdy awns are preserved. Eight of the spikes are more or less distinctly hirsute, twenty are smooth, that is without hairs visible to the naked eye. They all bear tufts of longer or shorter, stiff hairs below the base of the glume and above the articulation point, and usually a small tuft at the dorsal side of the glume base as well. In the majority of the spikes the internodes have slightly hairy margins, but this detail is very modestly developed, even in the otherwise hirsute specimens. It was not possible to segregate the hirsute spikes from the smooth ones by any other character as the pubescence occurs combined with other features in a seemingly quite fortuitious way.

It will appear from the Table (p. 15), in which the principal dimensions are accumulated, that the Ichetis crop was of an amazing variability. Very few of these specimens are of a size corresponding to the general conception of Emmer, and many have certain dimensions, as for instance length of internode, that would fit into the lower dimensional range in modern Eincorn.[13] On the whole it must be admitted that these spikes, to a superficial observation, are extremely deceptive and, as far as size is concerned, suggestive of Eincorn. This impression does not, however, stand up to a close morphological scrutiny.

In the attempt at establishing a reliable basis for identification of this wheat the two extremes were considered between which the Ichetis wheat must in any case be placed: the wild progenitor,[14] on the one hand, and the highly cultivated descendant, on the other. This comparison was applied to the two possibilities, Emmer and Eincorn. In the following the two diploid species will, for convenience, be called the Eincorn group, the two tetraploid species, the Emmer group, the former comprising only *T. Aegilopoides* and *T. monococcum*, the latter only *T. dicoccoides* and *T. dicoccum*. Certain details of the spikelet were selected which are homologous in the wild and the modern cultivated form of each of the two groups.[15] Thus the identification is founded upon the following characters:

I. The apex of the glume.
II. The capacity and character of the palea posterior.
III. The size, structure and proportions of the rudimentary flowers.
IV. The dimensions of the distal epidermis cells of the central portion of the palea.
V. The number of fertile flowers, and the shape of the kernels.

I. In the glumes of all the four species in question two particularly strong veins fork out from the woody spikelet base, framing a median portion of thick tissue. In the Eincorn group these veins run independently to the apex of the glume, the ventral slightly longer than the dorsal one, both ending in a solid point. In their upper part these veins are straight and somewhat convergent, but they do not tend to unite. The points are connected by the transverse margin of the glume, deflected into a deep curve.

In *T. dicoccoides* only the ventral vein ends in a strong point, the dorsal one being much shorter and its point hardly protruding above the oblique transversal margin. The ventral vein in *T. dicoccum* describes an even curve from base to apex, and the shorter, straight, dorsal vein points directly towards the tip of the ventral one, forming only a small notch at its tip.

This part is considerably varied in the Ichetis wheat. Even within the individual spike a pronounced variation can be noted (Pl. IV, d), but in no case is there any approximation to the design of the Eincorn group. The glume apices vary between the construction of the apex of *T. dicoccoides* and that of *T. dicoccum*. In one case, Specimen No. 25, the apices sometimes are even reminiscent of the design in *T. spelta*, but on a small scale. The mode of articulation of the specimen, however, refers it to the Emmer group. (Illustrations Pl. IV, a & d).

II. In the Emmer group the palea is of a generous width, suited to accomodate a considerable expansion of the breadth of the ventral side of the grain under its growth. Even in a well nourished, mature fruit the palea has a slight fold corresponding to the ventral furrow of the grain. In the Eincorn group this organ is narrow and not at all able to follow the transversal increase of the grain. So already at a fairly early stage of ripening the palea splits along the middle, leaving the convex ventral side of the grain bare.[16] Incidentally, the large sterile flower (second in the spikelet) takes over the covering function of the palea, excepting cases where two kernels are developed.

In no case split paleae were found in the Ichetis wheat. They were all wrinkled longitudinally and of an unemployed capacity corresponding to the full development of the kernel. (Illustrations Pl. IV, b, bottom row).

III. Generally speaking, two kernels are developed in the spikelet of the Emmer group, in the Eincorn group only one. A rudimentary continuation of the spikelet is present in both groups, consisting of one or more rudimentary flowers with distinct internodes between them. In the Eincorn group the paleae of the second (usually sterile) flower are fairly strongly built and approximately of the same length as those of the fertile flower. The third flower has a long, very thin internode and contains in its flimsy bracts the tiny rudiments of a fourth flower. In the Emmer group the second flower is usually fertile, and the third, containing one or more additional rudiments, is packed between the two kernels. The rudimentary spikelet continuation is much heavier in the Emmer group, especially the internode is wider and flatter than it is in the Eincorn group. Rudiments of *T. monococcum*, *T. dicoccum*, and two of the Ichetis wheat are shown in Pl. IV, b, upper row. It is evident that this part, too, ranges the antique wheat along with the Emmer group.

It may be added that the difference in shape and dimensions described for the two cultivated species was found equally decisive in the two wild ones.

IV. It would undoubtedly be possible to point out many parts of the spikelet in which the microscopical details afford indication of the association between the two related species and, at the same time, emphazising the difference between the two groups. However, for our needs it would suffice to pick out one portion of the same organ of all the species and compare them. As an area particularly suitable for the purpose the writer preferred the central portion of the palea posterior, in which the dimensions of the cells have proved to be tolerably constant, measured from the middle towards the keel or, in the case of the Eincorn group, from the rent towards the keel. The widths of the distal epidermis cells in this area proved typical to each group, and very different in the two groups. The stated average width of the sinuate-walled cells is one twentieth of the total width of 20 successive cells, and measuring was carried out in several places of the same object, by a magnification as great as possible, in the present case 8 × 30 diam.

In *T. Aegilopoides* the average width was found to be 10.6 to 13.9 μ, in *T. monococcum* 11.5 to 13.3 μ. These cells are much wider in the Emmer group, namely, in *T. dicoccoides* 20.0 to 21.5 μ, and in *T. dicoccum* 17.9 to 22.6 μ. Compared with these dimensions the Ichetis material definitely joins the Emmer group with the following cell widths: Specimen No. 25: 17.3 μ, No. 26: 18.7 μ, No. 16: 20.2 μ and No. 24: 20.8 μ. The four specimens selected for this test represent the smallest and the largest spikes, the shortest and the longest internodes. No. 25, which is one of the narrowest spikes, but the one with the longest internode, has the smallest cell width, but the cells of the most voluminous spike, No. 26, are almost as narrow. The greatest width was found in No. 24, which in every respect is one of the slightest of all the specimens. (Illustrations in Pl. III).

V. As mentioned above, the spikelets of the Eincorn group contain principally but one kernel. In consequence of this circumstance the shaping of the grain is in a certain sense only dependent upon the space available within the glumes. Thus the dorsal and ventral sides of the grain attain much the same shape, both being convexly keeled. The grain is approximately elliptical in cross section and its thickness is usually greater than its breadth. In most spikelets of the Emmer group two grains are developed, and consequently they restrict each other's development with the result that the ventral sides are flattened against each other. Under favourable growth conditions the Eincorn group may also develop two grains in the spikelet, but then one of them would be decidedly asymmetrical in cross section, and in any case they will both be small and slender.

All the twenty-two spikelets of the Ichetis wheat which were dissected and examined contained two kernels. Not one is fully developed; they are all meagre and shrunk, the majority literally empty fruit shells. However, such shape as is acknowledgable always corresponds to the shape of Emmer grains. No kernel has the convexly bulging ventral side that is typical of the Eincorn group, and, although narrow, the ventral side is in all cases flat or transversally hollow. Thus the evidence of the grains tally with that of the other four parts.

It was, of course, necessary to remove at least one spikelet from each of the Ichetis spikes in order to describe the interior parts. These spikelets were selected from the end of the specimen nearest to the middle of the originally whole spike or, in other words, as far from the top and bottom as possible. This precaution was taken as a means to secure a description of the spikelet typical of each individual spike, as extreme top and bottom spikelets are usually deficient in development. The same principle was, of course, followed at the selection of comparative material from recent spikes.

By detaching the spikelets for dissection it was learnt that the rachis is considerably tougher in the ancient wheat than in a modern, mature spike. This circumstance explains the peculiar fact that the Ichetis spikes did not disintegrate either when being handled in antiquity or at the recent transport and examination. The brittleness of the rachis of the Glume wheats[17] is a property that emerges when the end of the vegetation period is approaching, and it is dependent upon the state of maturity of the fruits. If an immature spike is cut off the rachis will not turn brittle.

Also the shriveled and meagre appearance of the kernels is an extraordinary feature, in that their state of shrunkenness cannot be the consequence of their long stay in the dry grave. If the content of mature starch had filled out the fruit shell it would have shrunk but negligibly even during this long time,[18] but these kernels must have been soft and contained a large proportion of water. The evaporation of the water is the reason for the shrinkage. The incompleteness of the grains account for the fact that the spikelets were not strained to their maximum transverse dimensions.

Therefore, the fundamental explanation of the toughness of the rachises and the shape of the kernels — and further the small transverse dimensions of the spikelets — is that these spikes were not ripe when harvested.

Considering the points so far enumerated we may be entitled to identify the Ichetis wheat as Emmer, T. dicoccum. In spite of a certain dimensional conformity with recent Eincorn the morphological discrepancies are too great for referring any part of the find to this species.

In the light of the present investigations and the experiences gained from them it would seem warrantable to discuss the previously recorded finds which are claimed to represent Eincorn.

According to the report on the Zozer deposit[19] two distinctly different types of wheat are present, identified as Emmer and Eincorn. They mainly differ by their dimensions, and it is typical that to a certain degree the smaller type (allegedly Eincorn) occurs as coherent pieces of spikes. From this fact it may be inferred that these spikes like the Ichetis material represent the cereal in some state of immaturity, and that the smaller dimensions are explained by this circumstance. The average length of internode in the alleged Eincorn is given as 2.3 mm., and agreement is claimed with Percival's average in the Eincorn internode, 1.8—2 mm. The justification of this claim is not quite apparent. Further, it appears from the illustrations that there is no principal difference between the internodes of the two alleged species. It is obvious, too, that the two types of grains do not vary as corresponding to the two species in question, but only as far as the state of development is concerned. Certainly neither of them corresponds to the general conception of the typical Eincorn kernel. Finally, the early stage of development is stressed by the very low density rate[20] of the spikes, as evident in the pictures.

Thus the present writer feels justified in suggesting that all the wheat of the Zozer deposit is Emmer.

Regarding the spike fragment from Omari[21]—which is carbonized—it seems as if the examiners based their opinion upon its small size alone. No characters justifying the identification as Eincorn are apparent from the published picture, but a very low density rate is evident (about 0.40), which indicates that also this spike was far from mature, in fact, it seems barely to have passed the flowering stage. This circumstance, combined with the shrinkage by carbonization, would account for its very small size.

As matters stand to-day the Omari find is hardly a suitable argument in the discussion, neither archaeologically nor botanically. The lowermost two spikelets ought to be sacrificed in an attempt at settling the question, but, as a positive result could not be guaranteed in advance, the spike being utterly fragile, this is, perhaps, too much to ask.

Thus we are not entitled to consider Eincorn as established for Egypt, and it may be that this is not going to happen in the future either. It is quite possible that Palestine, the present southern boundary of the distributional range of the wild T. Aegilopoides, is at the same time the possible southern limit of the cultivated Eincorn. If so, we shall never find Eincorn in the Nile valley. It appears from prehistoric finds from the area common to the two wild plants that they accompanied each other as cultivated plants from the early phases of agriculture,[22] and it is inconceivable that Eincorn should not have arrived in Egypt together with Emmer, if it could endure the soil and climate.

The classificatory aspects having been considered, still another problem claims attention: why was unripe grain employed in the burial rite? Was no ripe grain available at the time of the ceremony—or rather not sufficient of it—or may the immature spikes be regarded as the compliance with traditional burial prescriptions which demanded whole spikes of wheat?

Under certain circumstances ripe and unripe cereals may be available together at harvesting time, viz., after an unfavourable vegetation period. If a corn field is beaten down by heavy rain after a draught shortly after the fruits have started their development, the plants may sprout and ear anew, thus bearing two sets of spikes of considerably differing age. The older set will finish its development more or less normally, but the younger set will not catch up, and at harvesting time it will still be immature. Could this have happened in Egypt? The recession of the Nile after the inundation was finished at the middle of November (before the water control at Assuan was erected), and not until then the field work could start. Showers now and again occur in the early winter, but usually not after the end of December. The earing time may be estimated at some 60 to 70 days after sowing, and thus the flowering would take place some time after the middle of January or in early February, a time when rain is improbable. Consequently two stages of development could certainly not be the rule in an Egyptian crop, and the situation met with in the two grave deposits at Saqqarah is far from unique. As a matter of fact, a large number of deposits from Egyptian graves contain major portions of Emmer spikes which have not disintegrated and which were thus presumably immature. It is inconceivable that the crops generally were as bad as reflected in the Ichetis wheat, as the riches which allowed the erection of the immensely costly Pyramids were most certainly derived from a flourishing agriculture. If, on the other hand, we suggest that all interments containing immature wheat took place during the short spring time, we should undoubtedly get into conflict with the law of averages. For instance, some four centuries lie between the two Saqqarah graves, and immature wheat was contained in both.

Another explanation may be possible. If some old religious prescription demanded that whole—or green—wheat spikes be sacrificed at burials, the only possible way of complying with this ceremonial duty would be for the temples to store whole spikes permanently, cut at the short time when such were available in the spring.

The cereal names commonly met with in old Hieroglyphic texts are IT for barley, BT for Emmer, and a third word, SWT, is translated into wheat in a general, but botanically unspecified way. In her paper on the Zozer plants[23] Vivi Laurent Täckholm discusses the various possibilities of botanically defined translations of the word SWT. She rejects Macaroni wheat, *T. durum*, which has been suggested, on the grounds that the species cannot be considered as established for Egypt until Graeco-Roman times, and the word appears already in the old Dynastic texts. In consequense of the alleged presence of Eincorn in Omari and Saqqarah she propounds that species for the name. However, as appearing from the present discussion, the evidence offered must be described as inadequate for that solution. Incidentally, Spelt which is often brought up in connection with Egyptian words for wheat is out of the question, having at all times been confined to European soil and never being found in the Egyptian grain deposits.[24]

Judging by the actual plant material handed down to us SWT most probably represents a variety of Emmer which perhaps while alive was distinguished by some character that does not readily appear from the material in the mummified state. If so it rests with botanical morphology to find new ways and means of investigation, and to point out the finer distinctions in the Emmer material already recovered. There must be a difference when two names are employed, and it is difficult to accept the present situation: two names, but always only one of the plants appearing whenever we encounter ancient wheat.

APPENDIX

In order to give an impression of the great dimensional diversity and the morphological instability in the Ichetis Emmer certain related dimensions of each individual spike are set forth in the following list. These particulars may also be of use to future examiners, for comparison with other Egyptian grain deposits.

Most of the statements are quite simple as explained below, the dimensions being quoted in millimetres. Only the "density rate" requires a comment because it is calculated in an unorthodox way.

The traditional way of expressing the density of a cereal spike is simply to state the average length of the internode, or how many internodes per inch or other unit. As long as one is dealing with spikes of approximately the same grain size this method gives a fair idea of the density, and consequently conveys an impression of the angle between the longitudinal axis of the spike and that of the grain.

In the present case we are, however, dealing with a collection of spikes of such variability as to related dimensions that it cannot be described as one type, and thus the internode does not adequately characterize the density. Therefore it was preferred tentatively to express the density rate by the angle between the two axes, as represented by its sine. The formula for the calculation is this:

$$\frac{\text{Spk. B.} \times 0.5}{\text{Spl. L.}} = \text{D.R.}$$

Definitions and abbreviations.

The columns of the following list show these particulars:

No. : Specimen number as given in Plate I and II.
Hair : gl. = glabrous, pb. = pubescent.
Int. L. : Length of internode. Average.
Spl. L. : Length of spikelet from articulation point to the tip of the paleae.
Spk. B. : Breadth of spike. Average.

D. R. : Density rate according to the formula above.
Gl. L. : Variation of glume length from base to apex.
Dim. A.: Dimension A; the width of the ventral side of the spikelet fork as measured across the articulation scar.[25]
Dim. B.: Dimension B.; the width of the glume base as seen from the side.

(The two last mentioned are the only reliable dimensions in chaff of the Glume wheats and as such employed in the identification of spikelet parts, carbonized or occurring as impressions in clay.)

Table of related dimensions.

No.	Hair	Int. L.	Spl. L.	Spk. B.	D. R.	Gl. L.	Dim. A.	Dim. B.
1	gl	1.86	—	12.0	—	7.87–8.78	—	—
2	gl	1.98	—	11.1	—	8.60–8.97	—	—
3	gl	2.02	—	11.5	—	7.87–8.78	—	—
4	gl	2.33	11.9	12.4	0.52	9.52–9.70	2.55	0.99
5	pb	1.72	9.9	11.7	0.59	8.42–8.78	2.05	0.84
6	gl	2.01	11.3	10.4	0.46	9.15–9.70	2.24	0.95
7	gl	2.44	10.1	11.5	0.57	8.42–9.97	2.66	0.91
8	pb	1.99	10.4	11.8	0.56	7.69–8.42	2.43	0.87
9	pb	2.03	—	—	—	8.60–9.70	2.47	1.14
10	gl	2.00	10.8	10.5	0.49	7.32–7.95	2.66	0.99
11	gl	2.25	12.1	10.6	0.44	8.97–9.52	2.77	1.14
12	gl	1.74	10.6	11.9	0.56	8.60–8.97	2.62	0.91
13	pb	1.81	10.1	11.4	0.56	7.87–8.42	2.39	0.91
14	pb	1.91	10.1	8.9	0.44	7.69–8.24	2.31	0.87
(15)			lacking					
16	gl	1.86	9.3	10.1	0.54	8.24–8.60	2.28	0.87
17	gl	2.12	—	9.1	—	8.42–8.60	—	—
18	gl	1.98	10.1	10.8	0.53	7.87–8.60	2.62	0.95
19	gl	1.72	9.3	10.5	0.56	7.14–7.87	2.24	0.95
20	pb	2.09	10.4	9.9	0.48	8.24–8.78	2.39	1.10
21	pb	2.00	11.0	10.0	0.45	8.24–8.97	2.39	0.87
22	gl	2.24	—	10.0	—	7.69–8.42	—	—
23	gl	1.71	defect					
24	gl	1.77	9.3	9.6	0.51	7.69–8.24	2.13	0.91
25	gl	2.75	10.6	9.0	0.42	7.95–8.78	2.66	0.99
26	gl	2.31	12.3	12.4	0.50	9.52–10.25	3.04	1.25
27	gl	1.85	9.2	10.2	0.55	7.50 7.87	2.36	0.84
28	pb	1.90	9.7	9.9	0.51	7.95 8.42	2.24	0.76
29	gl	1.97	9.7	9.0	0.46	7.50–8.24	2.09	0.95

Numbers 1, 2, 3, were not dissected, and thus the exact dimensions of some of the organs could not be ascertained. These three specimens are entirely unique, even among the rich grain deposits of Ancient Egypt, showing the mark of the sickle in addition to the perfectness of numbers 1 and 2.

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15. The writer wishes to extend his most sincere thanks to Herbarium Aaron Aaronsohn, Israel, (Dr. Yoram Ephraty), for kindly supplying him with fresh spikes of varieties of *T. dicoccoides.*
16. E. Schiemann 1932. Entstehung —. (see 5). Illustration p. 82, after Flaksberger. (The organ in question is erroneously called *palea inferior.*)
17. The term "Glume wheats" comprises *T. monococcum*, *T. dicoccum*, and *T. spelta*, and is based exclusively upon their morphological relationship. Genetically they are of different lineage.
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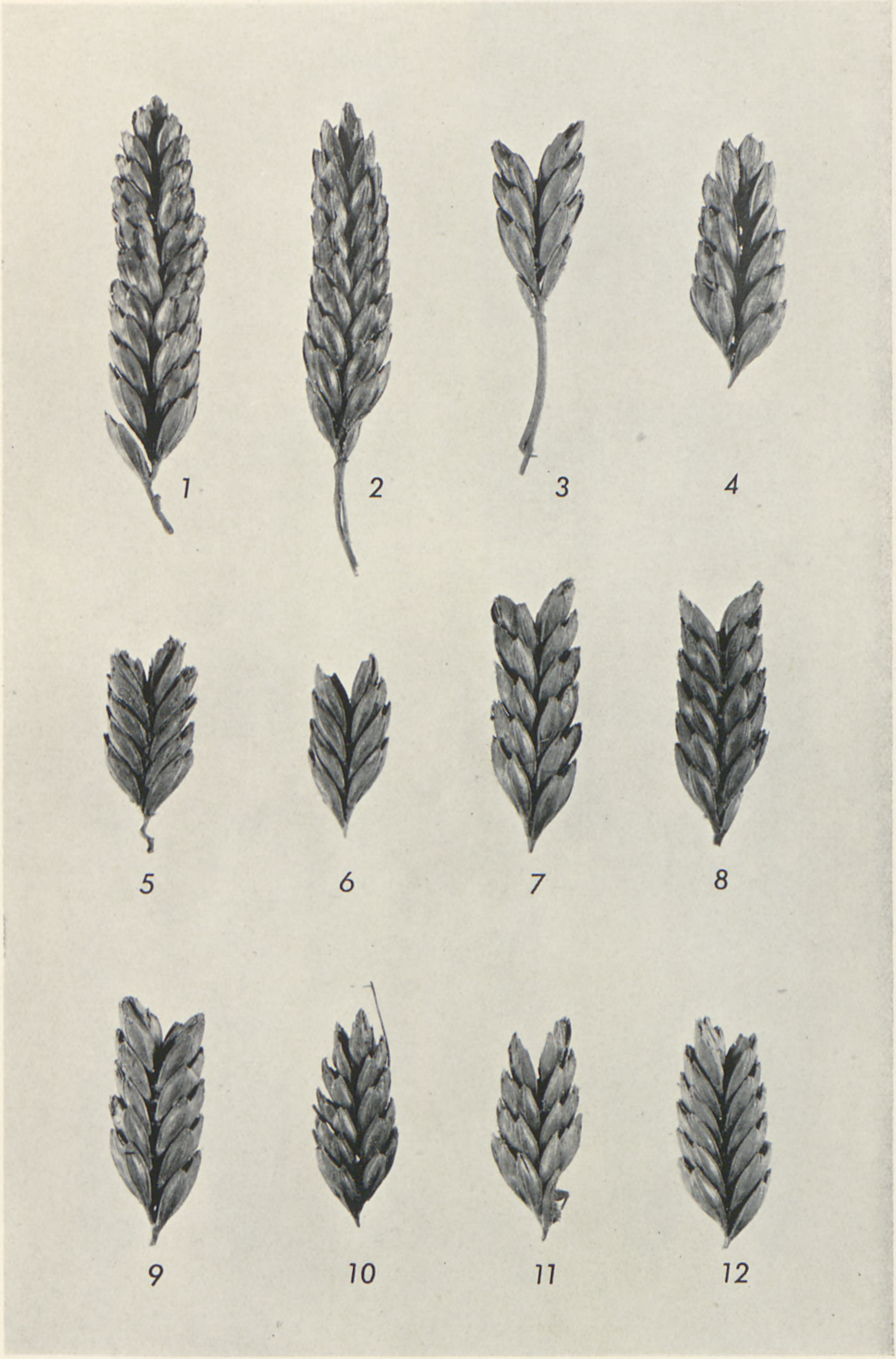
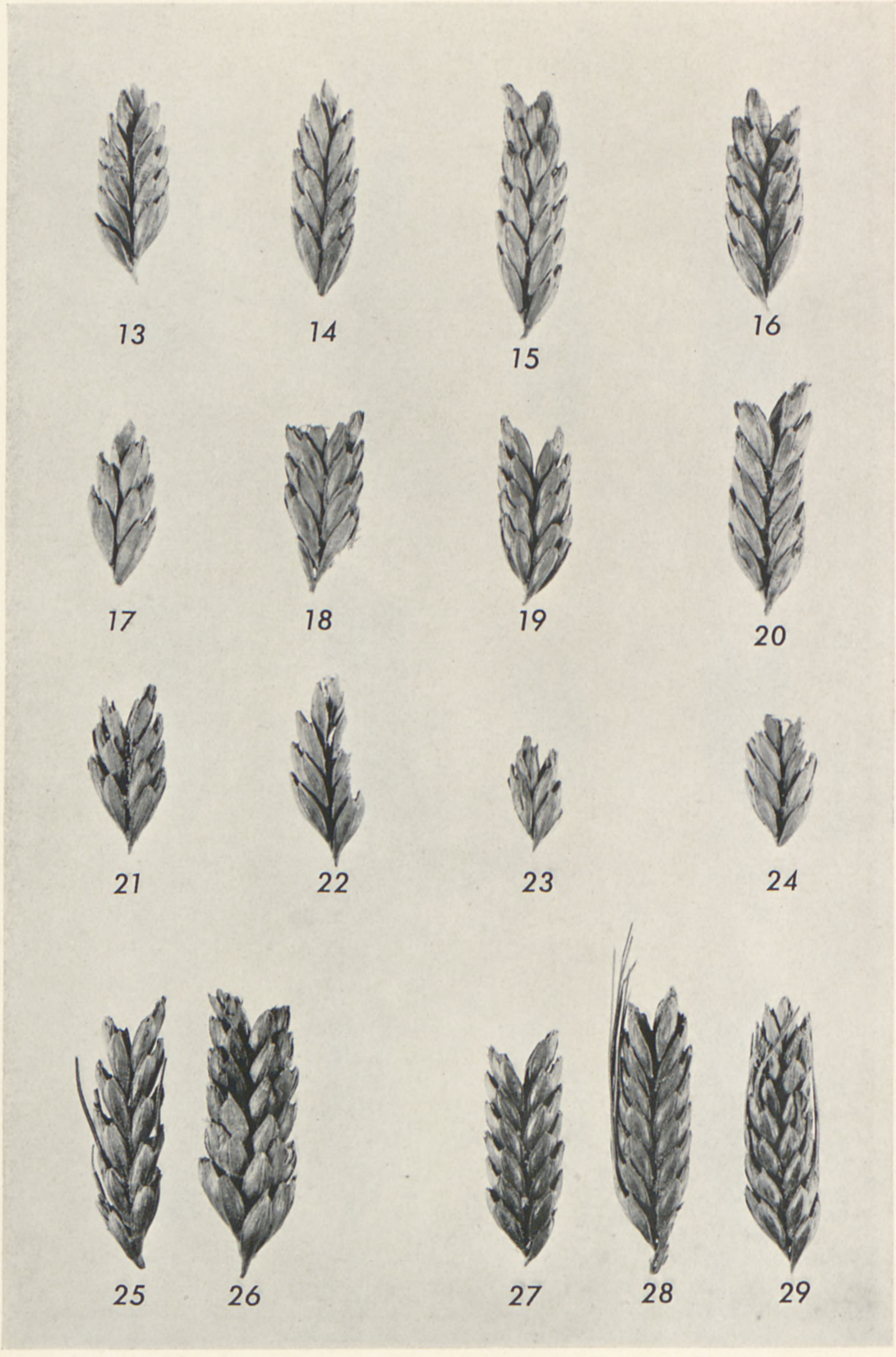
25. Knud Jessen 1939. Trouvailles de blé. (Therkel Mathiassen. Bundsø. Une station de récent âge de la pierre dans l'île d'Als.) Aarb. Nord. Oldk. Hist. fig. 36, p. 84. København.

Indleveret til selskabet den 25. marts 1953.
Færdig fra trykkeriet den 2. september 1953.

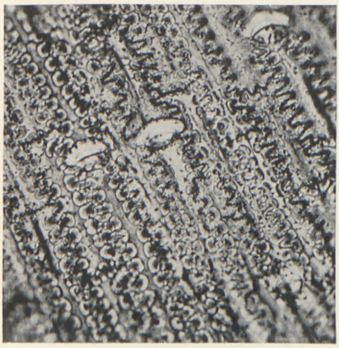


Queen Ichetis' wheat. Specimens Nos. 1—12, (natural size); phot. Riksmuseets Botaniska Avdelning, Stockholm.

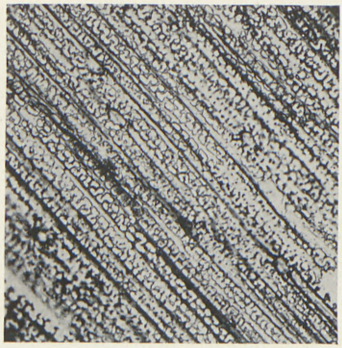
PLATE II



Queen Ichetis' wheat. Specimens Nos. 13—29. (natural size); phot. Riksmuseets Botaniska Avdelning, Stockholm.



a



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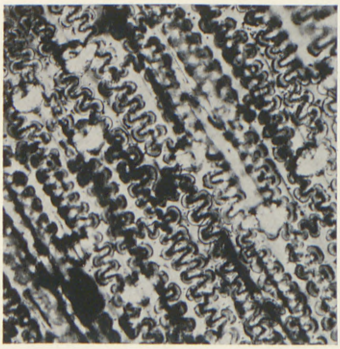

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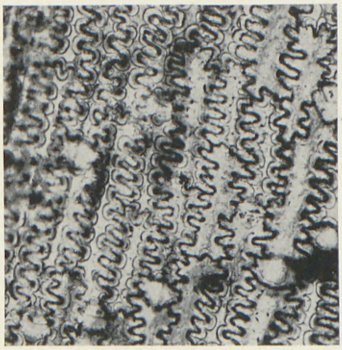

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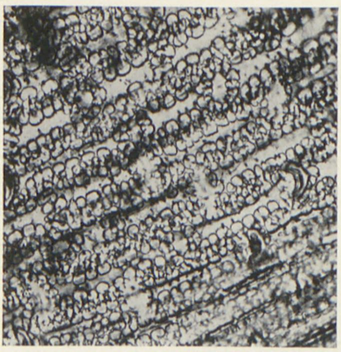

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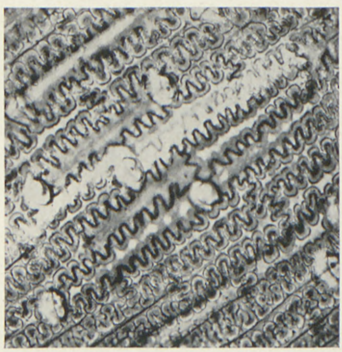


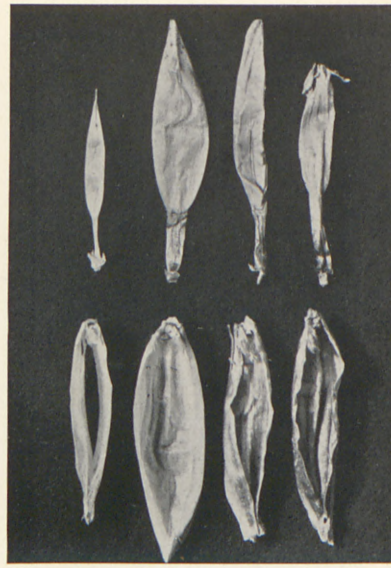
f

Distal epidermis cells of palea posterior from:
a. Ichetis No. 24 b. Recent *T. monococcum*
c. Ichetis No. 25 d. Ichetis No. 26
e. Recent *T. dicoccum* f. Ichetis No. 16.

c. 240 diam. phot. Hans Helbaek.

PLATE IV

a



b

c

d

a. Top row: glumes of glabrous and hirsute spikelets of the Ichetis wheat. Middle and bottom row: kernels of the Ichetis wheat.
b. Top row, from left: rudimentary spikelet continuation of recent *T. monococcum*; *T. dicoccum*; Ichetis Nos. 7 & 11.
Bottom row, from left: Palea posterior of recent *T. monococcum*; *T. dicoccum*; Ichetis Nos. 10 & 12.
c. Top row: Hirsute spikelets of small dimensions, Ichetis Nos. 14 & 28.
Bottom row: Glabrous spikelets of largest dimensions, Ichetis No. 26.
d. Ichetis specimen No. 25. Note glume apices.

c. 3 diam. phot. Hans Helbaek.