

# THE IDENTIFICATION OF CEREAL VARIETIES

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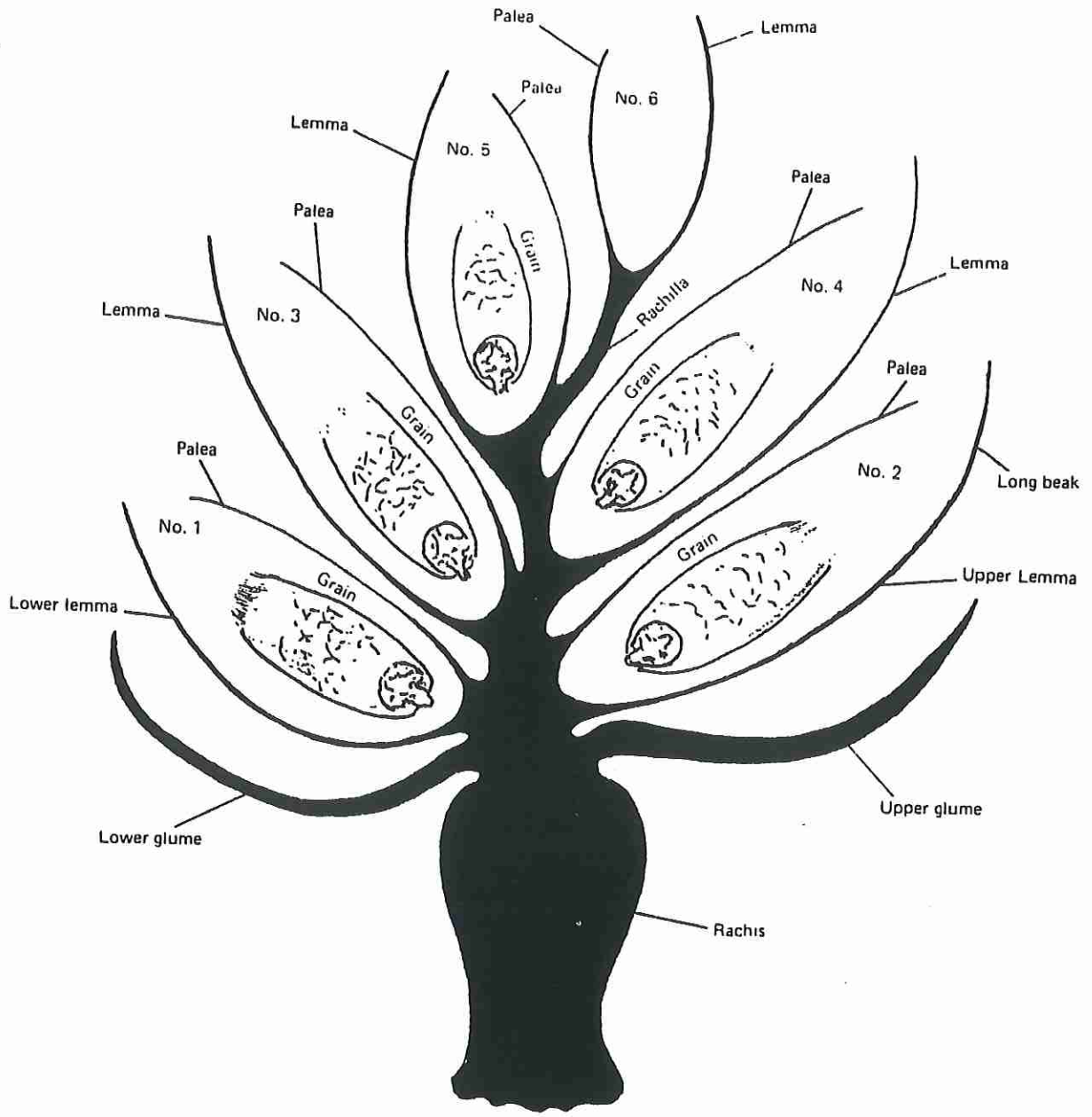
Text and Drawings by  
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A preliminary course of instruction in the study of the  
morphological structures used in Varietal Descriptions.

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Diagram of a wheat spikelet



## WHEAT The wheat spikelet (I)

A wheat ear consists of a series of spikelets in alternate arrangement. A spikelet is a cluster of separate florets or flowers.

The separate florets within the spikelets are produced from alternate sides of a rachilla, which is a lateral branch of the main rachis of the ear.

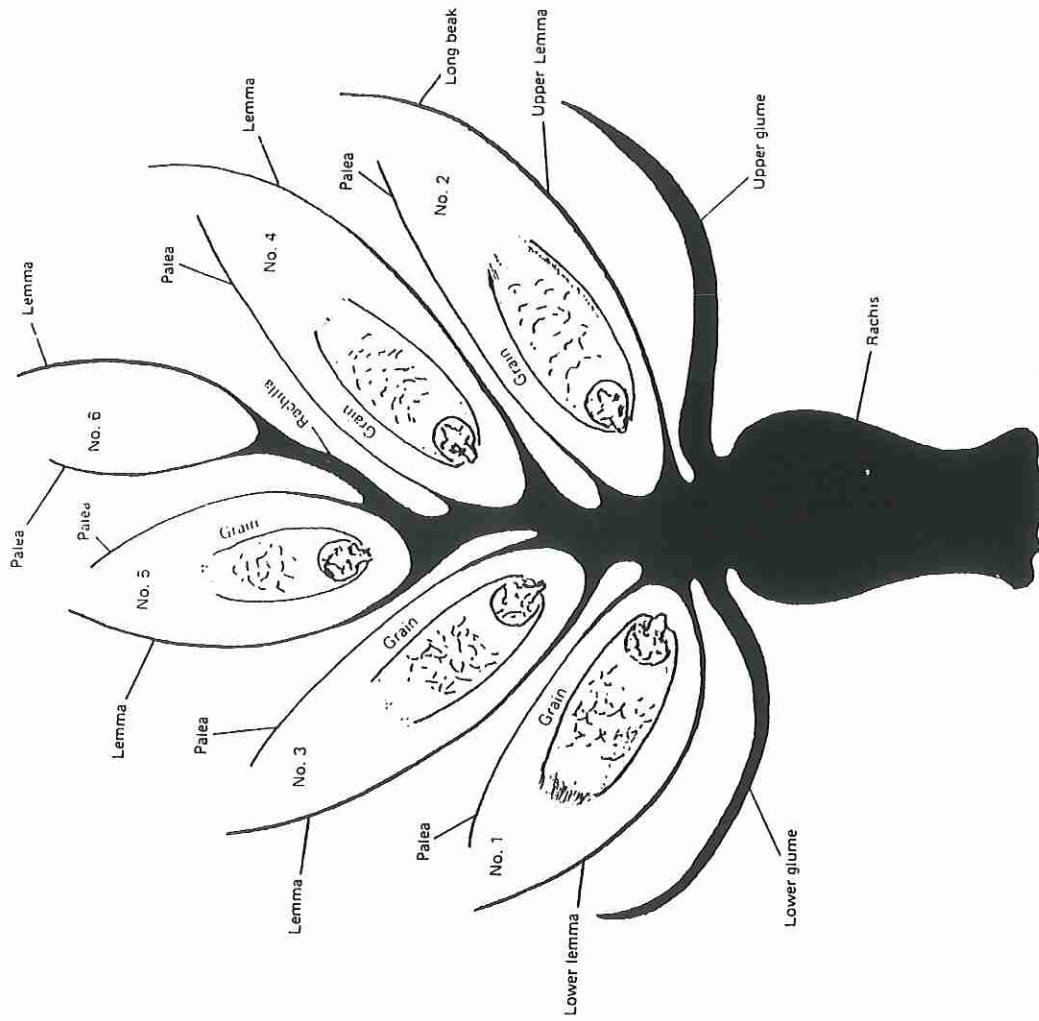
The diagrammatical representation of a typical spikelet in fig. 19 shows the arrangement of six florets within the spikelet. Each floret is numbered and it can be seen that these arise alternately on either side of the rachilla. Florets 1-5 have each produced a grain, but floret number 6 was unsuccessful.

At the base of the spikelet are two structures called glumes. The glume on the left is termed the lower glume because its point of attachment is below that for the glume on the right, which is termed the upper glume.

It will be noted that each floret has two structures which enclose the grain: the lower structure is a lemma and the upper one is a palea. These two structures protect the flower parts and later the caryopsis or grain.

The diagram opposite is, in fact, a representation of a spikelet which is illustrated in fig. 20 and described on page 36. This diagram will enable students to obtain a better understanding of the structure of a spikelet.

Fig. 19. Diagram of a wheat spikelet



## WHEAT Ear density

The density of an ear is determined by the relative length of the rachis segments.

Lax ears have long rachis segments with the result that the spikelets are some distance apart and this enables them to lie close up against the rachis segments. A typical lax ear is illustrated in fig. 15(i). As can be seen from the drawing, each complete spikelet is isolated, and if such a lax ear is held up to a light, the wide spacing between the spikelets can be seen. The drawing in fig. 15(ii) shows the same ear with all the spikelets removed.

In a dense ear the segments are short with the result that the spikelets are more densely packed together and are forced to grow at a wider angle from the rachis. A typical ear which could be described as medium dense is shown in fig. 15(iv) with its bare rachis, fig. 15(iii), alongside for comparison with that for a lax ear. When a medium dense or dense ear is viewed against the light, little or no light is seen through the compacted parts of the spikelets.

Several degrees of density are recognised and are used in varietal descriptions. The range is: lax, medium lax, medium lax - medium dense, medium dense - dense, dense. The density may vary over the length of an ear. Certain varieties may possess ears which are more dense at the base of the ear; or, in some cases the denser region may be at the apex.

**Caution:** ear-density may be affected by certain soil conditions or certain chemical sprays in that the ears may be more dense than is typical for the variety concerned.

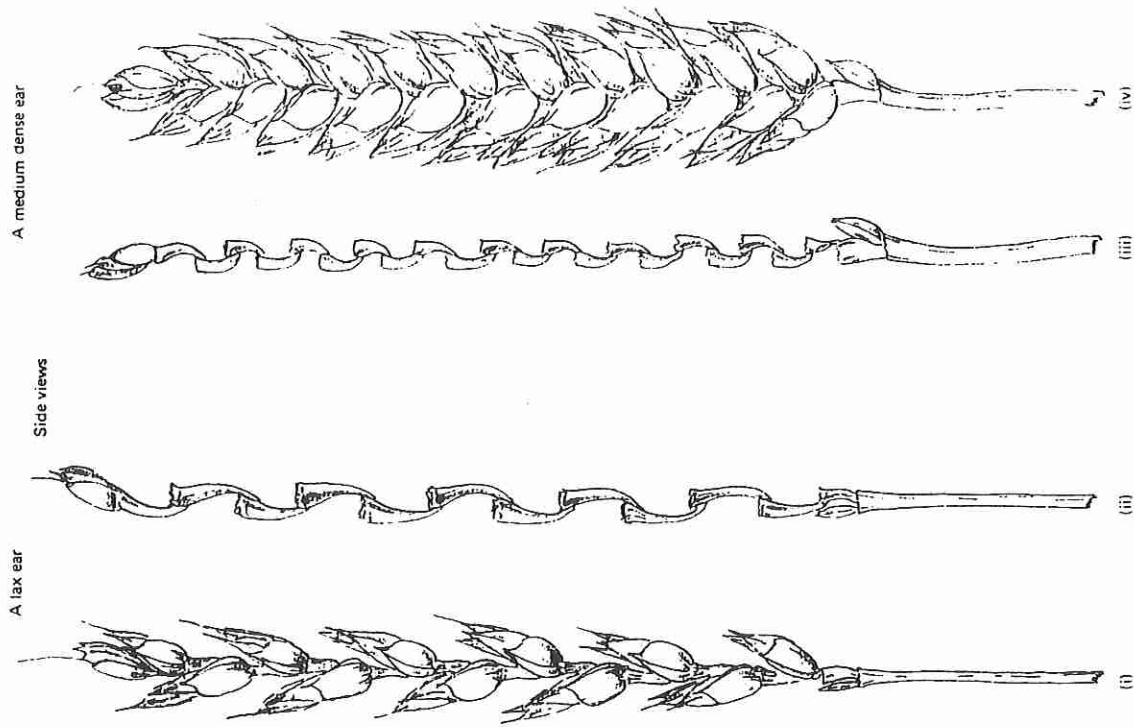
### Practical Study

- (a) Obtain as many different varieties as possible and place the ears on a bench in order of relative density. This method is valuable as a basis of visual comparison and classification.
- (b) Remove spikelets from lax ears and dense ears and compare the relative lengths of their rachis segments.

### Terms

Density. Lax ear. Dense ear. Degrees of density. Rachis segment.

Fig. 15. Ear density



## WHEAT The wheat spikelet (II)

The illustration opposite, fig. 20, is the same spikelet which was illustrated schematically on the previous page, in fig. 19.

Commencing at the bottom of the drawing the convex side of a rachis segment is shown; and, in a central position at the top of the segment is the site of a supernumerary spikelet.

Arising from the node are the two glumes with the lower one on the left and the upper one on the right.

The six florets then feature in an alternate sequence commencing with number 1 on the left above the lower glume. The last and incomplete floret, number 6, is shown at the apex of the spikelet; and, the section of the rachilla to which it is attached is visible.

The lemma and palea for each floret are shown, and it is between these two structures that grains are held.

It is very important that students know how to locate the lower glume of a spikelet because all classification work of the characters of glumes is carried out on lower glumes. They will find in official descriptions of wheat varieties that it is the lower glume which is used.

Whilst it may not be easy to determine which is the lower glume by studying the points of attachment of the two glumes, a simple method is available. The lower glume is always below the lemma with the smaller beak. In the drawing it will be readily seen that the lemma beak for floret number 1 is smaller than the lemma beak for floret number 2 on the right; and, this fact confirms that the glume on the left is the lower glume.

Lower glumes may be on the left or the right as there is no organised arrangement in the spikelets on an ear. Remember — *the lower glume is below the lower lemma with the little beak*.

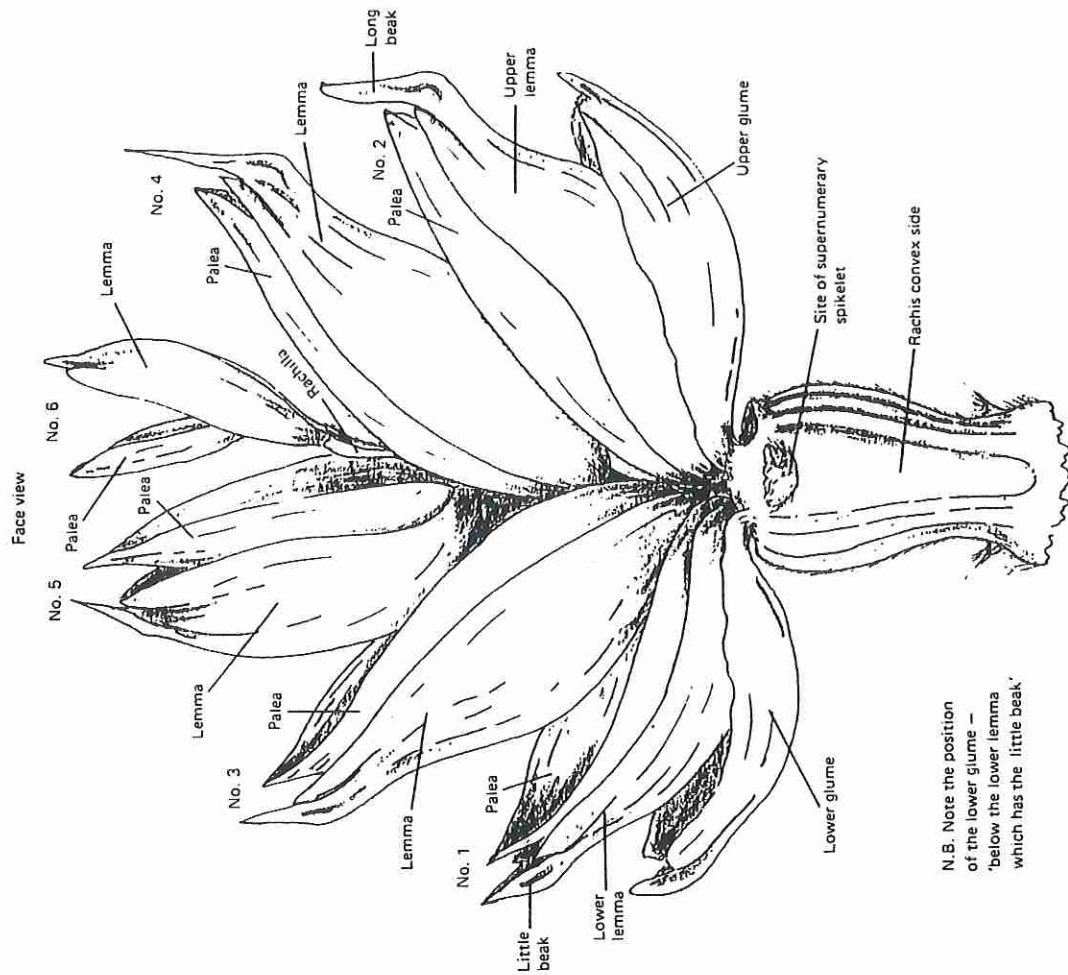
### Practical Study

- Examine a wheat spikelet in the mid-third region of a well-formed ear and identify the essential parts in comparison with the drawing opposite: fig. 20.
- Locate the lower glume in each of the spikelets on an ear by establishing the lower lemma with the smaller beak.
- Refer to several ears of other varieties and establish the lower glumes by reference to the lower lemma beaks.

### Terms

Lower glume. Upper glume. Rachilla. Floret. Lemma. Palea. Lower lemma. Little beak. Caryopsis (grain).

Fig. 20. A wheat spikelet



## WHEAT The wheat spikelet (exploded) (III)

The drawings on the opposite page, fig. 21, illustrate all the component parts of the same spikelet after they had been carefully detached in proper sequence.

The lower glume is shown on the extreme left of the bottom line, and the upper glume on the extreme right.

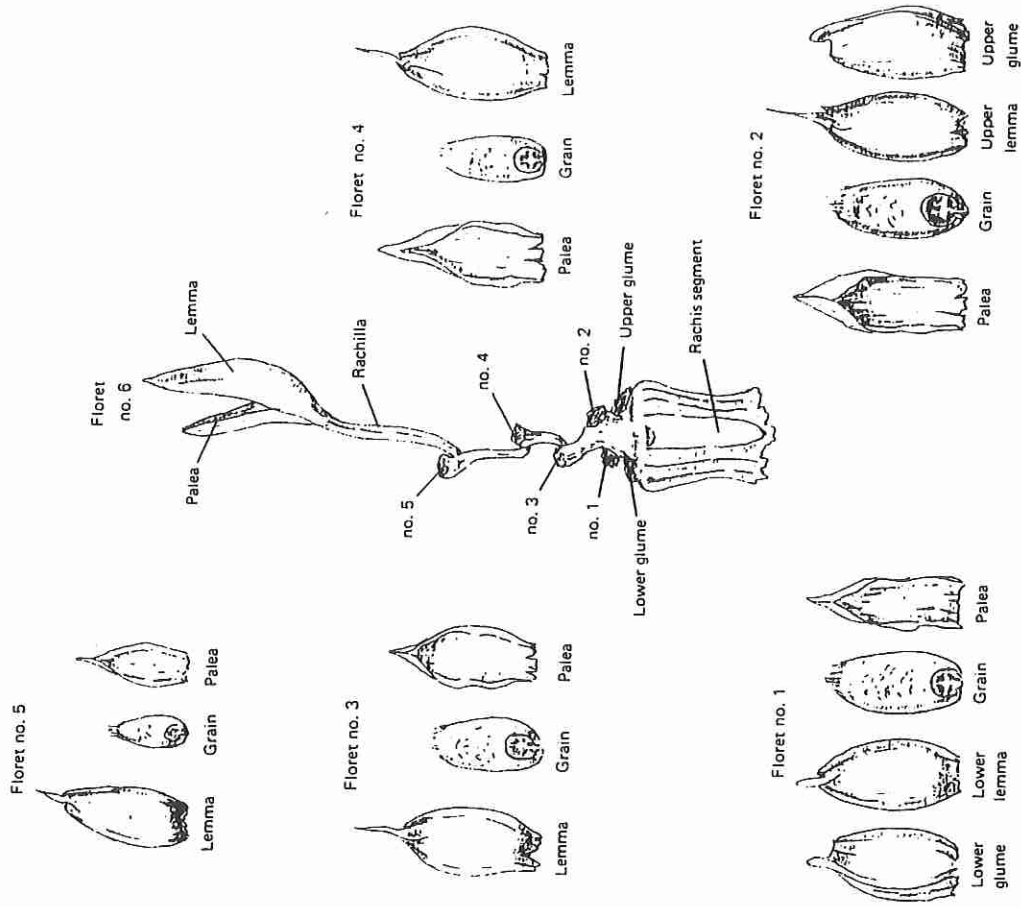
Each of the florets numbers 1-5 was detached, leaving the incomplete sixth floret still attached to the rachilla.

The points of attachment of the two glumes and the five florets are visible on the rachilla and identified.

### Practical Study

- (a) Select a well-formed ear and sever the rachis at the mid-point. Secure a rachis segment firmly to a board or card, and with scalpel and a pair of forceps carefully dissect each structure. Lay out each part as shown opposite.
- (b) Carefully mount the two glumes and the components of the first two florets on the Wheat Card in the same order as shown in the bottom line of the drawing.

Fig. 21. The wheat spikelet (exploded)



## WHEAT The lower glume – external view

Lower glumes from the mid-third region of a wheat ear provide many important characters which are used in the identification of wheat varieties.

A glume may be considered as being somewhat similar in shape to a small dinghy or boat in that it has a keel and two halves of the hull on either side. To examine the external side, the glume should be placed on a card with the keel uppermost.

The following features, as shown opposite in fig. 22, are used in varietal identification.

- Beak
- Keel
- Broad wing
- Broad wing lateral nerve
- Narrow wing
- Narrow wing lateral nerve
- Shoulder (the top margin of broad wing)
- Basal folds
- Basal hairs
- Bulge (the raised area of broad wing)
- Spicules on beak and keel
- Spicules on lateral nerves
- Membranes on margins of broad and narrow wings

Each of the above thirteen features are described in detail in subsequent sections and how they can be used in varietal identification.

### Practical Study

- (a) Carefully remove a lower glume from the mid-third region of an ear and study it with a  $\times 20$  lens or stereoscopic microscope. Identify each of the thirteen characters or features listed above and illustrated in fig. 22.
- (b) Mount typical lower glumes on the Wheat Card.

### Terms

Beak. Keel. Broad wing. Narrow wing. Lateral nerve. Shoulder. Basal folds. Basal hairs. Bulge. Spicules. Membrane.

Fig. 22. The lower glume

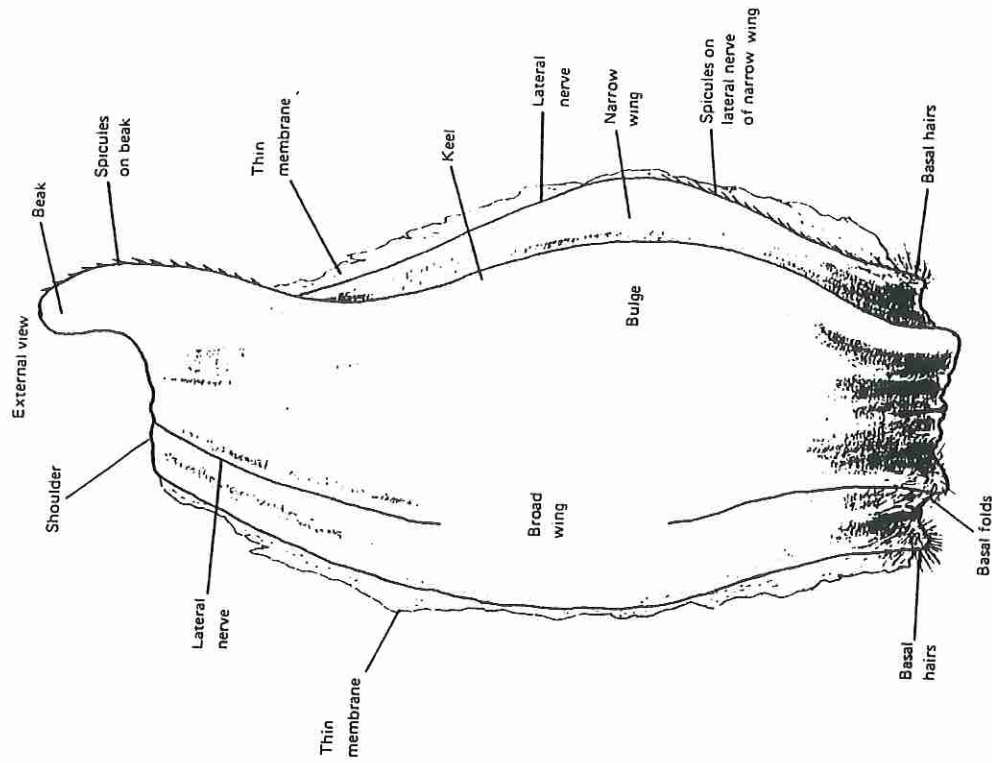
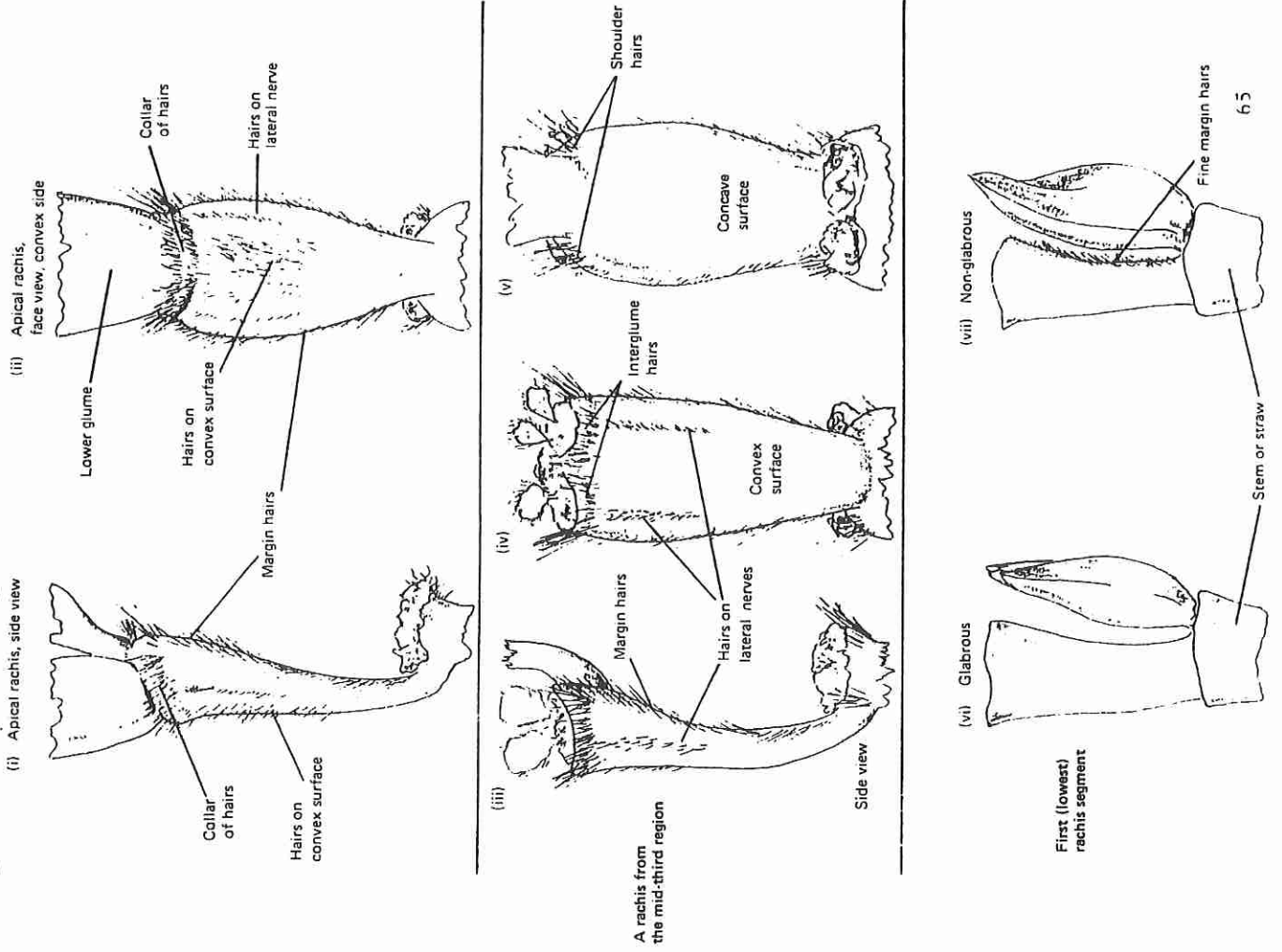


Fig. 33. Hairs on rachis segments



The presence or absence of one or more groups of minute hairs on various surface areas of the rachis segments can assist in varietal identification.

Three regions of the ear can be examined for these hair groups: the drawings opposite illustrate these features.

#### Apical Rachis Segment

The top two drawings, figs 33 (i) and 33 (ii), illustrate the side-view and face-view, respectively, of the apical or terminal rachis segment.

Many varieties possess a collar of fine hairs below the lower glume, but this collar of hairs can vary in its intensity and can be absent in some varieties.

Some varieties have numerous short hairs extending down the convex surface of this segment; these may be confined to the two lateral nerves or can also cover the central area. Hairs on the margins of the rachis segment may be long, short or absent.

#### Mid-third Region Segments

The three drawings, figs 33 (iii), 33 (iv) and 33 (v), represent the three views of a rachis segment from the mid-third region of an ear, and illustrate shoulder hairs, margin hairs, interglume hairs and lateral nerve hairs.

#### Lowest Rachis Segment

Fine margin hairs may be present or absent on the lowest or first rachis segment. Fig. 33 (vi) shows a glabrous (non-hairy) segment whilst in fig. 33 (vii), margin hairs are shown.

#### Practical Study

- Select varieties described as possessing one or more of these hair groups. Carefully remove spikelets from representative ears and study the appropriate areas under a stereoscopic microscope.
- Compare the length of hairs and the areas covered in different varieties.
- Mount typical examples on the Wheat Card.

#### Terms

Collar of hairs. Shoulder hairs. Margin hairs. Interglume hairs. Glabrous. First rachis segment.



## WHEAT Wheat grain characters

There are several features of wheat grains which can vary with different varieties and such features are frequently given as distinct varietal characteristics.

Many of these features may not be of use until the ear and grains are fully ripe and even at that stage variations can be masked by the health and condition of the plants. These features may be altered by harvesting and storage conditions and grains of a variety may appear to be very different when harvested in different localities or in different seasons. In spite of such environmental factors, it is possible to classify wheat grains according to certain characteristics.

Grain shapes can be divided into the three following main types according to the visual shape when the dorsal surface is studied, and these are shown opposite in figs 36(i)–(iii) – oval, ovate and elliptical.

The length of the brush-hairs on the apex of wheat grains can be used as an identification feature. Fig. 36(iv) illustrates the long-hair type; and fig. 36(v) the very short brush hairs. Each type is illustrated from the dorsal and side views. In certain varieties the grains may be without brush hairs.

The shape or outline of the embryo can differ in different varieties and the two drawings, figs 36(vi) and (vii) show embryos which are oval or circular when viewed from the dorsal side.

Some varieties produce grains with a distinctive transverse grooving across the ventral side: a typical example is shown in fig. 36 (viii). This groove or 'thumbnail' impression is at right-angles to the crease which longitudinally divides the ventral side of the wheat grain.

In some varieties the tip of the radicle can be seen when a grain is viewed from the ventral side: such a feature may be described as a prominent radicle, fig. 36 (ix).

The grains of most wheat varieties are red when fully ripe: some varieties have white (cream) grains.

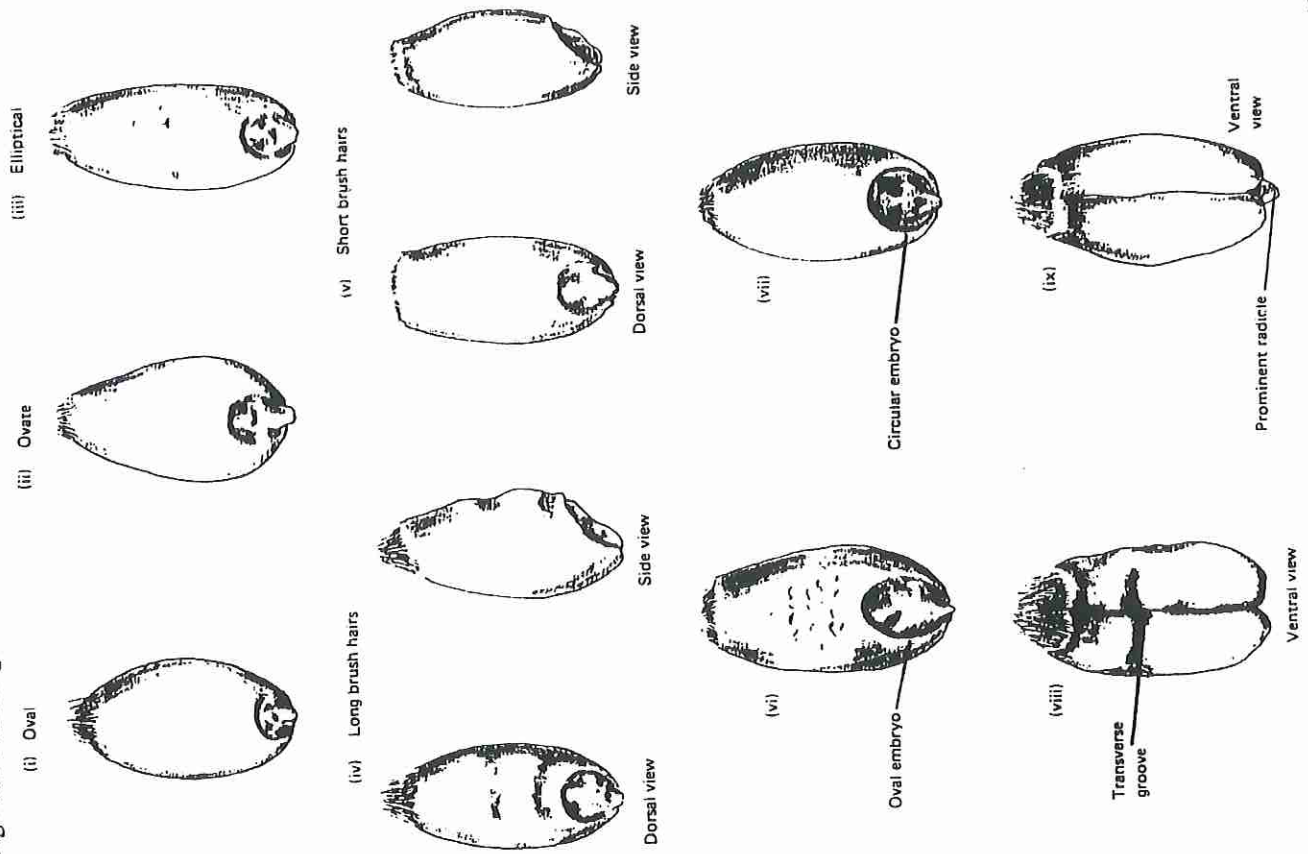
### Practical Study

- (a) Descriptions of varieties should be studied and those with grains possessing the above features should be selected and grains removed from the mid-third regions.
- (b) Samples of varieties grown in different environments and seasons should be studied.
- (c) Mount typical examples illustrating each feature on the Wheat Card.

### Terms

Oval. Ovate. Elliptical. Brush-hairs. Embryo shape. Transverse groove. Prominent radicle. Red grain. White grain.

Fig. 36. Wheat grain characters



## WHEAT Apical spikelet

The uppermost spikelet of a wheat ear is called the apical or terminal spikelet. It lies at right angles to the lower spikelets and consists of a lower and upper glume and one or two florets. The centre drawing opposite, fig. 32(i), illustrates the side-view of a typical apical spikelet. Certain features of the apical spikelet are used in varietal descriptions, particularly the apical regions of the two glumes.

The lower glume is usually strongly attached to the rachis node and appears to form a continuation of the contour of the convex surface of the rachis.

The upper glume arises from the concave side of the rachis and its superior point of attachment can be determined by direct visual examination.

Both glumes differ from the glumes of the lower spikelets in that they are symmetrical. The lower glume has two prominent nerves which may produce a 'nick' on the upper margin of the glume. Fig. 32(iii) shows a shallow 'nick' whilst a very deep one is shown in fig. 32(iii). The upper glume has a strong median nerve which can extend to form a median beak. The beak may be long as shown in fig. 32(iv).

The upper glume in fig. 32(v) is truncated or shortened and such a feature may be given as a varietal description. The upper glume illustrated in fig. 32(vi) has a rounded apex. In certain varieties the upper glume may have a very small 'nick' instead of a median beak.

In certain varieties the lemma awns may cross; this is a useful feature.

The various hair groups on the apical rachis segment are discussed in the next section.

### Practical Study

- Compare the apical spikelets of different varieties with official descriptions.
- Identify the lower and upper glumes and note that the lower glume is difficult to detach.
- Study the upper margins of lower glumes and note the 'nick' depression created by the two lateral nerves.
- Study a range of upper glumes and the relative length of the median beaks.
- Mount a complete apical spikelet and examples of lower and upper glumes on the Wheat Card.

### Terms

Apical spikelet. Terminal spikelet. Symmetrical. Median nerve. Median beak. Truncated.

Fig. 32. Apical spikelet

