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# AUSTRALIAN WHEAT VARIETIES

IDENTIFICATION ACCORDING TO  
PLANT, HEAD AND GRAIN CHARACTERISTICS

SECOND EDITION

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## **Preface to the Second Edition**

This second edition of 'Australian Wheat Varieties' is provided in response to the continuing need for information on the visual identification of wheat varieties in Australia. The first edition (1975), its reprinting (1979), and the supplement to it (1978) have proved popular with the grain industry. The second edition includes 18 wheats registered since preparation of the Supplement, together with reprinted descriptions of 23 others considered to be still important, and the introductory section which would otherwise not be available as the first edition is out of print. Relatively little revision of the varietal descriptions or of the explanation of terms has been necessary in the second edition, but some new information on older wheats has been added, particularly concerning disease resistance. The second edition does not include the illustrations, in Supplement No. 1, of grain defects, foreign seeds and insects of grain.

## **Acknowledgments**

We appreciate assistance given by Departments of Agriculture/Primary Industries and by grain marketing and handling authorities. In particular, we are grateful for the provision of samples and plant descriptions by Geoff Ferns (Vic.), Ray Hare (N.S.W.), Gil Hollamby (S.A.), Lindsay O'Brien (Vic.), Jeff Reeves (W.A.) and Dave Rosser (Qld).

The technical assistance of Robyn Smith (CSIRO Wheat Research Unit) is gratefully acknowledged. We thank Will Rushton (CSIRO Division of Food Research) for colour photography.

## **Introduction**

This handbook provides a practical description of wheat grain, heads and plants at several growth stages. It is designed to assist in distinguishing varieties currently grown throughout Australia, in the regions where each is usually grown. It is directed at a broad audience, including those involved with the grain trade at all stages, from seed production, through growing and harvesting, to receipt and segregation, sales and utilization.

Although Australia-wide in its overall approach, it is hoped that the handbook will form a basis to meet specialized local needs. Thus smaller sets of sheets, relating to local groups of varieties, might be selected and additional comments added, in the space provided, relating to the particular locality and season. In such a case, the characters that show the greatest differences between the particular varieties should be selected for identification.

### **Use of the Handbook**

Visual identification of wheat varieties might be considered comparable to the identification of handwriting. Although an individual writes a particular word or letter slightly differently each time, there is always a consistent and characteristic similarity. In the same way, although no two wheat grains are identical, observation of certain characteristics can be used as a basis for identification.

When examining wheat samples the main requirement is experience. This handbook is offered as a reference and as an aid in gaining familiarity with wheat varieties. However, it is not a substitute for experience nor is it intended primarily as a training book. For characters that involve dimensions, actual sizes are indicated in the handbook. In the early stages, measurement of samples using a metric rule or vernier calipers will be necessary, but it is hoped that with experience actual measurement will be needed only occasionally.

Even in expert hands, it cannot be expected that visual examination of a sample will always provide absolute identification, especially if, for example, only grain is available. If necessary, preliminary visual identification can be augmented by further examination at a central site using specialized procedures, such as pathogen resistance of seedlings, or various laboratory tests on the grain, including the phenol test, protein electrophoresis and quantitative hardness testing. (See Selected Bibliography.) In contrast with visual examination, these methods can be applied satisfactorily even to atypical grain (e.g. pinched, shrunken).

### **How the Book was Prepared**

The head and grain characters chosen were those that could be most readily assessed and that varied least with growth site and season. Nevertheless, some variation is inevitable and the descriptions given are those generally found. The

characters considered most reliable are ranked earliest in the list for each stage or form of sample.

Characters used are partly based on those of Symes (1958) with further assistance from Briggie and Reitz (1963) and several other similar publications. (See Selected Bibliography.) Plant growth characters were mainly chosen by R. W. Fitzsimmons and R. H. Martin as a result of observations over a number of years. Descriptive terms and cut-off ranges, chosen to suit the set of varieties considered, may differ from those used in other systems designed for a wider diversity of wheats.

The summary keys or tables are arranged so that they can be used as a key for varietal identification.

Varieties and sites were selected in consultation with officers of the State Departments of Agriculture, who also supervised seed purity, growth and harvesting.

Despite attempts to base descriptions on material from a number of sites and seasons, the range of samples examined has been of necessity limited. The authors would appreciate receiving constructive criticism and notification of errors in descriptions for use in possible future revision. From time to time it is expected that additional sheets will be available to describe newly released varieties.

## General Information about Varieties

The description of each variety begins with some general background information. Terms used are explained below.

### Pedigrees and Registration Data

This information was supplied by Mr K. J. Symes, Registrar of Cereal Varieties in Australia. Of the various ways of expressing pedigrees, we have used the form described by L. H. Purdy *et al.* (1968) (*Crop Sci.* **8**, 405). In this notation an initial cross is indicated by a slash (/) and later crosses appear as //, /3/, /4/, etc. A backcross is shown by an asterisk (\*) preceded by a number indicating how many times the recurring parent was used. In this system the pedigree of Gatcher is

Thatcher/Santa Catalina//Mayo/3/Gabo \*3/Charter

This indicates that the result of a cross between Thatcher and Santa Catalina was crossed with Mayo after which the final cross was made to a line resulting from a triple backcross of Charter to Gabo. In the classical handwritten notation, the pedigree is

[(Thatcher×Santa Catalina)×Mayo]×{Gabo×[Gabo×(Gabo×Charter)]}

A more recent notation (R. R. Lamacraft and K. W. Finlay (1973) *Euphytica* **22**, 56) shows this pedigree as

(Thatcher \* Santa Catalina) \* Mayo \* (Gabo)3\* Charter

This third method is explained as it is also used in some parts of Australia. A cross is designated by an asterisk (the computer form of the handwritten X). Crossing order is indicated by brackets and sequence from left to right. A recurring parent is shown by



placing its name in brackets followed by a numeral to indicate how many times it was used.

## Abbreviations

For varieties with names longer than four or five letters, abbreviations have been assigned so that they are compatible with abbreviations for a large number of overseas variety names. Rules for abbreviation are described by L. W. Briggles *et al.* (1960) (*Agron. J.* 52, 613).

## Maturity

Difficulty can be experienced in determining the ripening date of a plot or crop, particularly in wet weather. Usually all the heads of a variety mature within a few days, but this is not always so. For the purposes of this handbook, the first day on which at least 10% of plants showed matured heads has been taken as the date of maturity. A reliable indication of the ripening of particular heads was the drying out of the last main node on the tiller bearing the head, i.e. the node from which the top-most, or 'flag', leaf arises. The 'date of maturity' is usually reached a few days to a week after the yellow-ripe stage, at which the tiller has changed to a golden tint, and the grain has a doughy consistency.

In the individual descriptions, maturity has been classed as very early, early, early midseason, late midseason or late. These assessments are based on observations made at a number of sites over one or more years, and at Temora Agricultural Research Station over several years. The descriptions would apply loosely to most of the Australian wheat belt, but rather large allowances should be made for seasonal, sowing time and site variations.

These variations are the result of varietal interactions with environmental factors, especially day length (the period of sunshine in each 24 hours) and cold. Australian cultivars range from those with relative insensitivity to day length (e.g. Condor) to those which need fairly long days before ear development can proceed normally (e.g. Pinnacle). Cold requirement varies from virtually nil (e.g. Eagle) to about 3 weeks of 'cold' (temperatures below 10°C) before ear formation can begin, as in the winter wheats Winglen and Windebri; types between these extremes, but still with an appreciable cold requirement, are described as spring wheats having a moderate response to cold (semi-winter, e.g. Festiguay and Olympic require 10–15 days of cold). In warmer parts of the wheat belt these cold responsive varieties may be delayed in maturity, or they may not head normally, if at all.

Obviously, differences of latitude and sowing time will affect the day lengths and temperatures experienced during growth. Temperatures are affected by altitude, and they can also vary considerably from season to season in the same place.

The figures in Table 1 exemplify the differences that can occur at one site. They are compiled from data obtained at Temora Agricultural Research Station on representative varieties in at least six sowings over 4 or more years. The times of sowing were always within the normal sowing season. Although there have been differences of up to 45 days in the one variety from season to season in the time to reach maturity, the ranking of varieties according to maturity has been reasonably constant.

**Table 1. Maturity ranges of representative varieties grown at one site**

Variety	Maturity class	Number of days from sowing to ripening				Number of observations
		Actual range for variety	Mean	Difference from Gamenya		
				Range	Mean	
Songlen	Very early	163–205	184	–8 to +1	–3	9
Gamenya	Early	164–209	188	0	0	21
Cook	Early midseason	169–211	190	+3 to +8	+5	6
Olympic	Late midseason	172–212	195	+1 to +14	+7	21
Isis	Very late	185–219	207	+7 to +22	+15	9

### Pathogen Resistance

Information on resistance to major diseases was provided by the National Rust Control Program (University of Sydney) and the Agricultural Research Institute (Wagga Wagga). Specific genes for rust resistances were mainly taken from Circular No. 12 (December, 1981) of the National Rust Control Program; modifications to these gene listings may later be necessary. The presence of any specific gene for resistance does not necessarily confer effective resistance to current strains in the field.

### Quality Type

Categories used are bread, biscuit, multipurpose and macaroni wheat. Varieties acceptable for hard or soft special grades of wheat for the 1981/82 harvest are indicated as bread or biscuit wheats, respectively. Durum wheats, which are suitable for pasta products and not for bread, are indicated as macaroni wheats.

### Growth Sites

These were chosen for each variety in consultation with the Departments of Agriculture in all States. The variety descriptions were compiled mostly from samples taken at the site(s) where each variety is most usually grown, and for the most normal seasonal conditions.

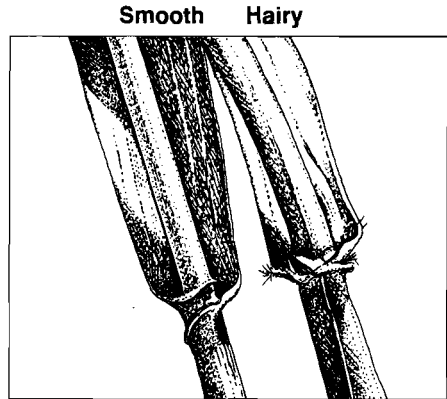
## Explanation of Plant Characters

Descriptions are provided for each variety at two stages of vegetative growth, i.e. before heading. The first of these stages (3–6 leaves on the main tiller) occurs about 4–6 weeks after sowing and the second stage (6–8 leaves on the main tiller) about a month later. Descriptions at the stages of flowering and maturity are then given.

### 1. 3–6 Leaf Stage

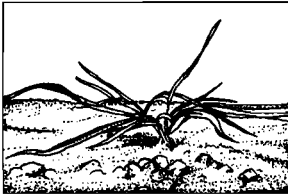
#### 1.1 Auricle

A pair of auricles is found at the base of each leaf blade. They are curved, claw-like appendages that clasp the sheath and stem from opposite sides. Auricles are either *smooth* (no hairs at all) or contain a number of unicellular hairs that are easily visible to the naked eye. A few varieties, e.g. Condor, are not fixed for this character and occasionally smooth-auricled varieties show a few hairs on the auricles in the very early stages of growth.

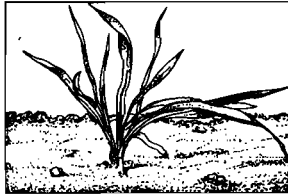


#### 1.2 Habit

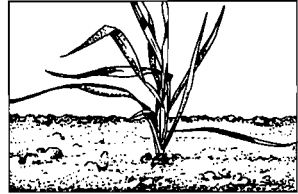
##### Prostrate



##### Intermediate



##### Erect



In early stages of growth, wheat varieties show a marked difference in habit of growth which is commonly, but not always, related to maturity. A variety is classed as *prostrate* if the leaves tend to lie along the ground, *intermediate* if the bulk of the leaves make an angle of 45° with the ground, *erect* if the leaves are vertical or nearly so.

#### 1.3 Leaf length

##### Short

##### Medium

(14 to 16 cm)

##### Long

The length of leaves varies according to seasonal conditions. They are generally longer in a good season. Nevertheless, each variety tends to fall into the same class in most seasons. In extreme seasons, allowances must be made to avoid placing varieties into the wrong category.

Leaves are measured from the tip to the base of the blade where it joins the sheath around the stem. At the first growth stage the third leaf on the main tiller is measured.

Class as *short* if less than 14 cm, or as *long* if more than 16 cm. Generally, the measurements of at least five plants should be averaged.

#### 1.4 Leaf width

**Narrow**

**Medium**  
(5.5 to 7.0 mm)

**Wide**

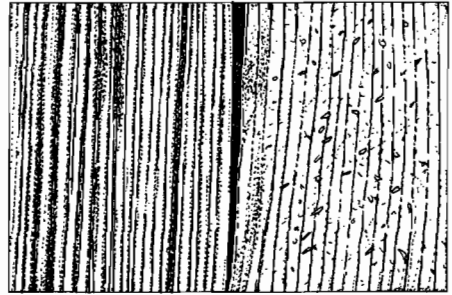
Similarly, width of leaves varies according to the season. In a good season the leaves are wider. As in the case of leaf length, each variety tends to fall into the same category in most seasons. Allowances for expected variations should be made in extreme seasons. Leaves are measured at their widest part. The same leaves are measured for length and width. *Medium* width is 5.5–7 mm. *Narrow* and *wide* are outside these dimensions. Generally, take an average of about five plants.

#### 1.5 Leaf pubescence

If a leaf is held up to a strong light, particularly sunlight, most varieties show the presence of very short hairs on the upper surface of the leaf blade, especially towards the tip. In some cases, and especially in durum varieties, very little pubescence is found but in other varieties, abundant pubescence is present. The observation should be made at the middle of the leaf on the upper surface, for the third leaf of the main tiller.

**Light**

**Abundant**



#### Secondary characters (3–6 leaf stage)

In addition to the main characteristics listed above, other features are useful for distinguishing certain varieties. Such features, listed as secondary characters, are indicated when appropriate in a varietal description.

*Leaf colour.* Indicate if foliage is *light green* (e.g. Songlen), *mid green* (e.g. Gamenya), or *dark green* (e.g. Kewell). The colour of the foliage should be judged by reflected light, rather than by transmitted light, i.e. on a sunny day, have your back to the sun.

*Plant length.* Note when generally *very short* (less than 15 cm long), *long* (25–30 cm) or *very long* (over 30 cm). This dimension can be useful under good growing conditions, when very short types, especially, can be easily picked out. Measure the distance from ground level to the tip of the longest leaf, when the plant is stretched out vertically so that no height is lost through leaf droop or non-erect habit.

## 2. 6–8 Leaf Stage

At this stage it may be difficult to be sure of the actual leaf count on the main tiller because of withering of the earliest leaves.

#### 2.1 Auricle

**Smooth**

**Hairy**

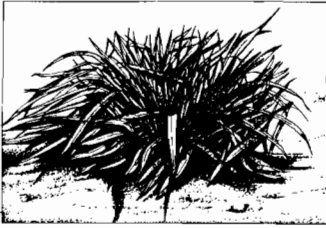
As described for Section 1.1, first growth stage.

## 2.2 Habit

## Intermediate

## Erect

## Prostrate



As described for Section 1.2, first growth stage, except that at the second stage of growth the leaves are more erect than at the first stage.

## 2.3 Leaf length

## Short

## Medium

## Long

(21 to 24 cm)

Measure the length of the last fully developed leaf on the main tiller. Class as *long* if greater than 24 cm, as *short* if less than 21 cm.

## 2.4 Leaf width

## Narrow

## Medium

## Wide

(12 to 14 mm)

Measure width on the leaf examined for length. Class as *narrow* if less than 12 mm in width, as *wide* if more than 14 mm.

## 2.5 Leaf pubescence

## Light

## Medium

## Abundant

As described for Section 1.6, first growth stage.

**Secondary characters** (6–8 leaf stage)

*Leaf colour.* *Light green, mid green, dark green*, estimated as the general coloration of an expanse of the crop, with the sun shining from behind the observer.

*Leaf blade droop.* *Straight, drooping.* This character, though rather dependent on growing conditions, can be useful. In some varieties the leaf blades tend to remain almost *straight* while in others the foliage is more flaccid and *droops* more or less, particularly towards the distal (furthest from the stem) end of the blade.

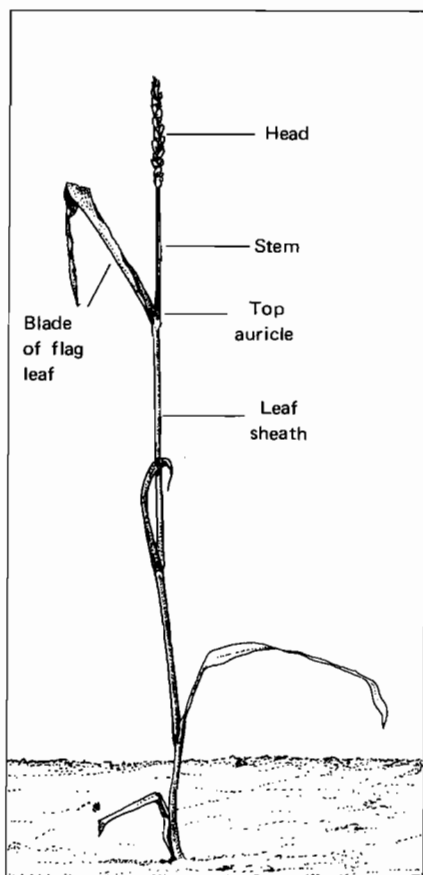
*Extent of tillering.* Count the number of tillers (stems) per plant. Less than five is considered *light* tillering. *Heavy* tillering is more than eight tillers per plant. The average of about five plants should be taken.

*Abundance of foliage.* *Sparse, abundant.* This character varies with the season, good seasons favouring better tillering and larger leaves. Tall varieties with light tillering and well spaced leaves are classed as having *sparse* foliage, while fairly short varieties with heavy tillering and closely spaced leaves are classed as having *abundant* foliage. Winter and semi-winter wheats mostly fall into this category. Most varieties are intermediate for this character.

*Plant length.* *Very short* (less than 20 cm long), *short* (20–30 cm), *long* (40–50 cm) or

very long (over 50 cm). Plant length is measured as at the 3–6 leaf stage. This measurement is more useful in favourable seasons, when unusually long or short types can be easily recognized.

**Awns.** The ears of some spring wheats are often sufficiently developed at this stage to distinguish fully awned types from those which are tip or half awned. The ear, still within the plant, can be found by dissecting the 'false stem' formed by the leaves.



*A single tiller (flowering stage)*

### 3. Flowering Stage

At this stage most heads are showing some evidence of flowering (indicated by the presence of stamens hanging from the head). Many of the characteristics of the mature head may be used for identification at this stage.

**Head characters** (see Sections 5.2 and 5.4 to 5.10)

Apart from glume colour and head shape in cross section, many of the features

described for the mature head also apply at flowering. For example, the presence of awns is particularly useful at this stage. The dimensions of glumes tend to be slightly greater at flowering than at maturity.

**3.1 Top auricle height**                      **Short**                      **Medium**                      **Tall**  
(60 to 70 cm)

Top auricle height is measured from the base of the plant (the 'crown', at ground level) to the uppermost pair of auricles, i.e. the junction on the stem of the sheath and blade of the flag leaf. This height is used as it is relatively stable compared with the height of the ear at this stage of rapid stem elongation. Class as *short* if this measurement on five plants averages less than 60 cm, and as *tall* if it is greater than 70 cm.

This height can be a valuable clue to the identity of a few varieties under reasonably good growing conditions. Nevertheless it is highly variable, particularly in types that tend to be tall. In poor growth regimes all varieties may be short; in an exceptionally lush season most top auricle heights can be between 70 cm and 90 cm with a few below this range (e.g. Shortim) or above (e.g. Kewell).

**3.2 Flag leaf length**                      **Short**                      **Medium**                      **Long**  
(18 to 21 cm)

Measurements of length, width and length/width ratio of the flag leaf, i.e. the uppermost leaf on the stem, are made in a manner similar to that used for leaves at the earlier stages of growth. A *short* flag leaf is shorter than 18 cm; a *long* one is longer than 21 cm.

**3.3 Flag leaf width**                      **Narrow**                      **Medium**                      **Wide**  
(15 to 17 mm)

Class as *narrow* if less than 15 mm in width, and as *wide* if greater than 17 mm.

**Secondary characters** (flowering stage)

*Head colour.* Heads of a few varieties are completely green, with no bluish tints at flowering (e.g. Timgalen); most are more or less semi-glaucous, but in a few cases heads are distinctively *glaucous* (pale greyish-blue) (e.g. Eagle, Kite).

*Leaf colour.* *Light green, mid green, dark green*, as indicated for earlier growth stages.

*Abundance of foliage.* *Sparse, medium, abundant*, as described for the second stage of growth.

*Habit.* The habit is classed as *compact* when stems and foliage are fairly erect so that a significant area of bare ground can be seen between rows. It is classed as *spreading* when the stems and foliage from adjacent rows merge into each other so that it is difficult to differentiate discrete rows of plants at a distance.

#### 4. Maturity

##### Head and grain (see Sections 5 and 6)

All the features of head and grain are available for identification at this stage. In addition, the following secondary characteristics can be observed in the standing crop.

<b>4.1 Plant height</b>	<b>Short</b>	<b>Medium</b> (95 to 110 cm)	<b>Tall</b>
-------------------------	--------------	---------------------------------	-------------

Measure from the base of the plant to the top of the ear, ignoring the awns. Class as *short* if up to 95 cm and *tall* if over 110 cm high. Although varying greatly in response to season, height can be a valuable clue to identity under reasonably good growing conditions.

<b>4.2 Straw strength</b>	<b>Weak</b>	<b>Medium</b>	<b>Strong</b>
---------------------------	-------------	---------------	---------------

This is a varietal character, but is much influenced by disease and seasonal conditions, e.g. drought, heavy rain, strong winds after flowering. The straw is classed as *weak*, *medium* or *strong*.

##### Secondary characters (maturity)

*Straw diameter.* The diameter of the straw, measured 1 cm below the base of the head, is classed as *slender* if less than 2.1 mm or *thick* if over 2.4 mm.

*Straw solidity.* Cut the stem about 1 cm below the base of the head and examine the size of the central hollow in relation to straw diameter. Some varieties have comparatively *thin-walled* straw. At the other extreme, the straw of durum wheats, for example, is nearly *solid*.

*Angle of head to stem.* In most varieties the head is held erect, but in a few, e.g. Gatcher and Olympic, the head and stem are usually well bent over (nodding).



## Explanation of Head Characters (at maturity)

Throughout the handbook, the illustrations of heads (spikes, ears) are reproduced at half actual size. Glumes are illustrated with grains at four times actual size. In the illustration for each variety, the head on the left is shown in face view and the head at right appears in side (lateral) view.

### 5.1 Glume colour

**White**

**Brown**

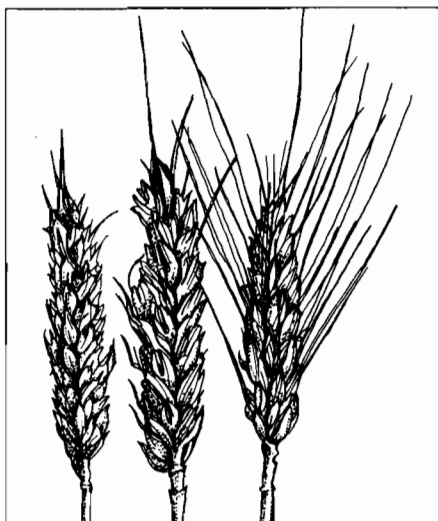
Many varieties have *white* (or cream) glumes, so that the head appears white and the outer glumes are much the same colour as the rest of the chaff (lemma and palea). However, about one-quarter of the varieties described have *outer* glumes that are tinted *brown*, especially at the edges, thus giving a characteristic colouring to the head as a whole.

### 5.2 Awns

One of the most distinguishing characteristics of the head is the presence or absence of awns — the long, hair-like extensions of the lemmas (inner husks). *Fully awned* or bearded heads are readily identified, for they carry relatively long awns (the longest usually more than 5 cm) right from the base to the tip of the head. In *half awned* types the awns tend to be concentrated at the top of the head, being small or absent near the base of the ear, and the length of the longest awns is usually less than 5 cm and more than 2 cm. Heads described as *tip awned* have short awns (less than 2 cm long) near the tip of the head. Some varieties, not included in this booklet, have no awns at all and are called awnless or bald.

Eagle, Kite, Festiguay and some other varieties classed as tip- or half-awned are distinguished by a single prominent awn on an otherwise tip-awned head.

**Tip awned**      **Half awned**      **Fully awned**  
(2 to 5 cm)



### 5.3 Head cross-section

**Flattened**

**Square**

This character refers to the shape of the head viewed from above and should only be used for well-filled heads. It takes into account the combination of head width as seen from the side, looking between the spikelets (side or lateral view), and the width as seen with the spikelets in full face view (dorso-ventral view). If these two widths are equal at

the maximum width of the head, the head is *square*. If the head is obviously narrower in lateral view than in face view, class as *flattened*. The other possible shape, laterally flattened, applies to Tincurrin and sometimes Festiguay.

**5.4 Head, side view**

When the head is seen from the side, the head appears *oblong* in shape (ignoring awns) if all spikelets are well filled to the tip of the head. In some varieties the upper spikelets fill poorly so that the head appears *tapering* in side view for, say, the upper third. Olympic and Condor have characteristically tapering heads. If the head does not obviously fall into one or other of these categories, class as *intermediate*. Festiguay, generally oblong, sometimes shows a clubbing of spikelets at the top of the head so that it actually appears to widen towards the top (clubbed head). The Tincurrin head is so clubbed that it appears oval.

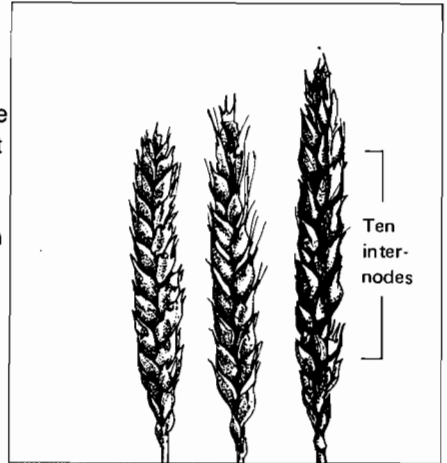
**Oblong Tapering**



**5.5 Head density**

The general appearance of the head is largely a reflection of head density — a measure of the distribution of spikelets along the central rachis. A very dense head, with the spikelets crowded together, tends to be short and squat (clubbed). A lax head has the spikelets well spread out along the rachis, so that the head has long internodes (the section of the rachis between attachment points of adjacent spikelets). Head density is defined by measuring the length occupied by ten internodes of the rachis in the middle of the head. *Dense*, ten internodes occupy less than 4 cm; *medium*, ten internodes occupy 4–5 cm; *lax*, ten internodes occupy more than 5 cm.

**Dense Medium Lax**



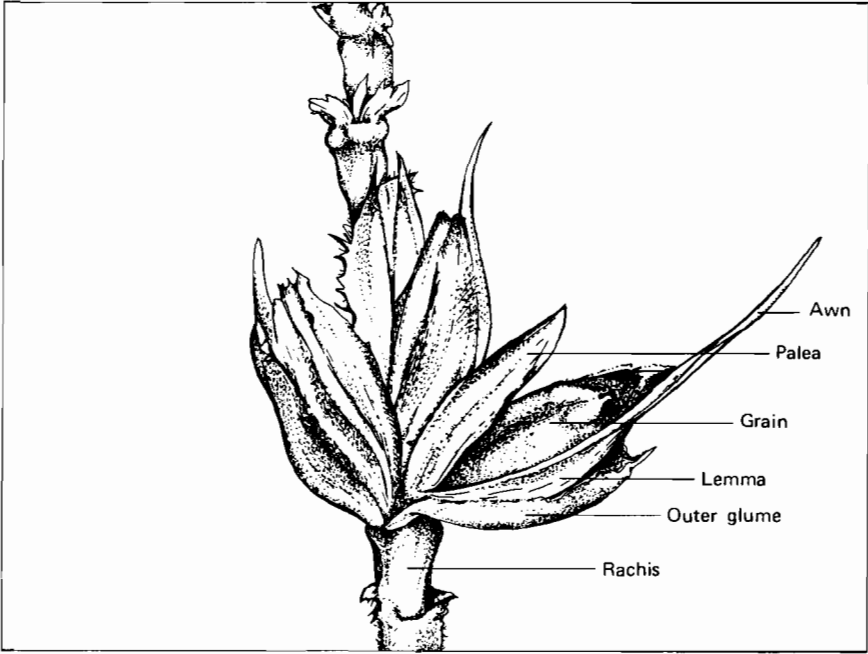
**5.6 Head length**

**Short**

**Medium**  
(8 to 10 cm)

**Long**

Although the length of heads varies considerably even within a sample, some varieties tend to have characteristically short or long heads. For example, heads of Kite are particularly long, whereas Tincurrin and Festiguay have short heads. Measure head length from the top of the head (ignoring awns) to the first node of the rachis (top of the stem). Class as *short* if the average length for a sample is less than 8 cm, *medium* if 8–10 cm, *long* if over 10 cm.



### 5.7 Glume beak length

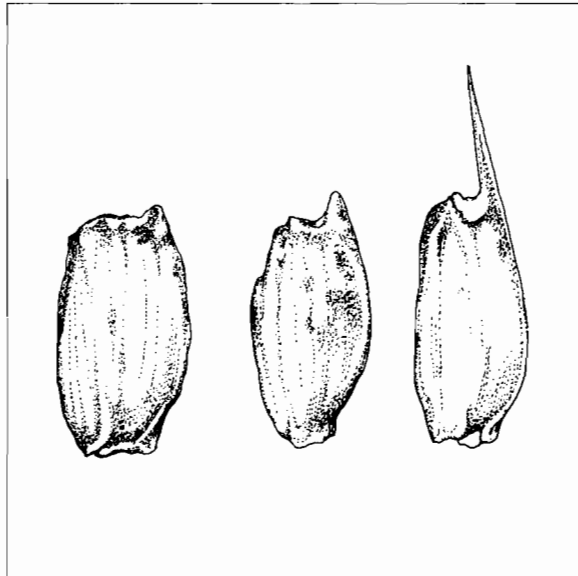
Glume characters refer only to the *outer* glumes (not the lemma and palea). Only glumes from the central third of the head should be examined. All characters are based on the face view of the main glume surface, neglecting the short folded-back area.

The length of the beak is measured from its tip, down the keel (folded edge) to the point where it arises from the glume. Class as *short* if the beak is almost absent or well under  $\frac{3}{4}$  mm long (e.g. Kite), as *medium* if it is  $\frac{3}{4}$ – $1\frac{1}{4}$  mm long, as *long* if greater

**Short**

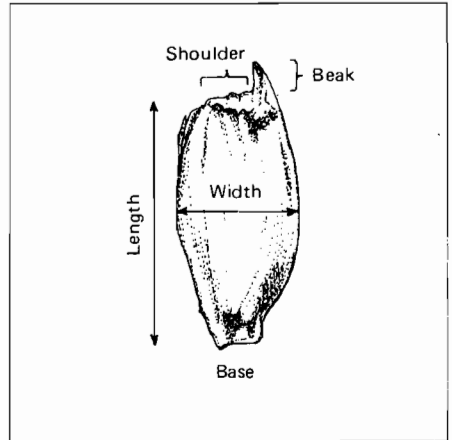
**Medium**  
( $\frac{3}{4}$  to  $1\frac{1}{4}$  mm)

**Long**



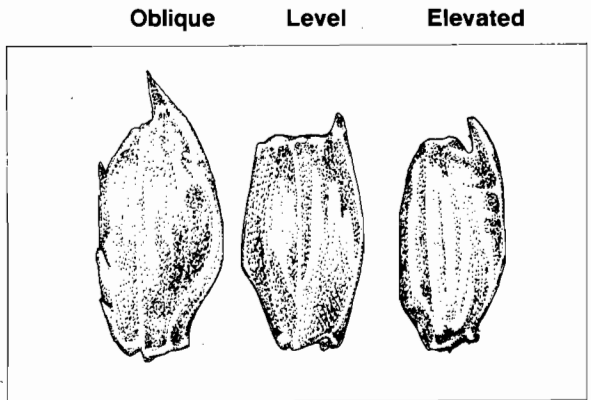
than 1 ¼ mm (e.g. Olympic and most bearded varieties). Olympic and Kewell have beak lengths shorter than other varieties in the long-beak category. In some cases, glumes from the bottom of the head have shorter beaks than glumes from the top.

This character is less reliable for glumes in a grain sample as the beak is easily broken off.



**5.8 Glume shoulder**

Shoulder shape refers to the curve of the upper edge of the glume on the opposite side from the beak. The glume is *oblique* if the shoulder falls away sharply from the beak. The upper edge of a *level* glume is approximately at right angles to the line of the beak. If the shoulder is raised towards a point, the glume shoulder shape is *elevated*.



This character in particular tends to depend on the position of the glume in the head. Glumes from the central third should be examined.

In addition to the above aspects of shoulder shape, the width at the shoulder compared with the overall glume width can be a useful characteristic.

**5.9 Glume length**

**Short**

**Medium**  
(8 to 9 mm)

**Long**

Measure glume length from the base, as normally broken off, to the highest part (usually the shoulder) excluding the beak. Class as *short* if less than 8 mm, *medium* if 8–9 mm, and *long* if greater than 9 mm.

**5.10 Glume width**

**Narrow**  
(4 mm and less)

**Medium**

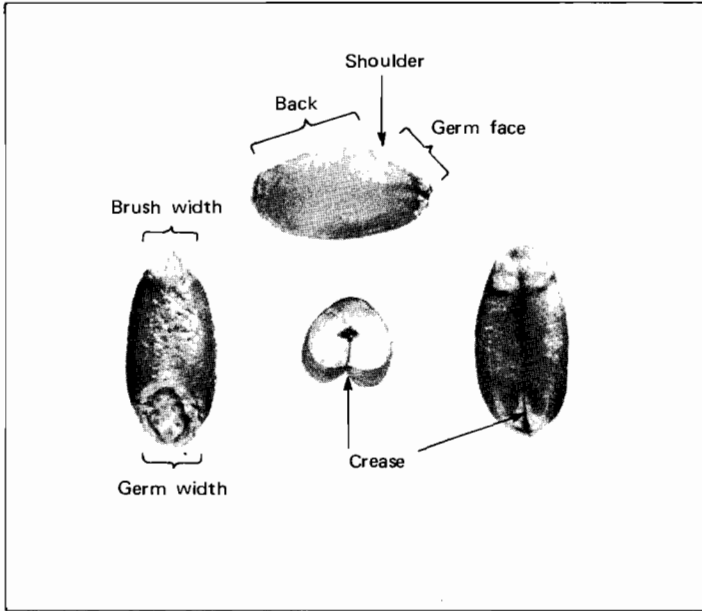
**Wide**  
(4.5 mm and more)

Glume width is measured at the widest part of the face view, neglecting the short portion folded back. *Narrow* glumes are 4 mm wide or less, *medium* are more than 4 mm but less than 4.5 mm, and *wide* glumes are 4.5 mm wide or greater.

## Explanation of Grain Characters

If an accurate identification is to be made, the grain should be sound and plump, not rain-damaged or pinched by drought or disease.

Grain illustrations for each variety are reproduced at four times actual size.



### 6.1 Grain hardness

**Soft**

**Hard**

Judge grain hardness by the ease of cutting the grain with a razor blade or of biting it. Varieties have been listed as either *soft* or *hard* to permit an initial division on this basis for the summary key. Though listed first, for this reason, it is not necessarily the most reliable of the grain characters. The distinction is difficult with some varieties which tend to be intermediate in hardness. Furthermore, it can be affected by seasonal conditions. In doubtful cases, use both parts of the summary key. It is often, though not necessarily, related to grain texture (6.9).

For more detailed examination, various laboratory procedures are available for quantitative assessment of hardness (Wrigley and Shepherd 1974).

### 6.2 Grain length

**Short**

**Medium**  
(6 to 6.5 mm)

**Long**

Actual measurements cannot give an infallible guide to grain dimensions, since these tend to differ depending on seasonal conditions. Rather, grain length and width are significant in relative terms for each season. From season to season, changes in one

dimension tend to accompany changes in the other dimension, since grain shape tends to be reasonably constant for a variety. Only well-filled grains should be examined. Dimensions serve mainly to give a ranking of varieties. Length and width are of most value for distinguishing extremes (e.g. durums and Lance as long, Festiguay as short); many varieties may be classed as medium for these characters.

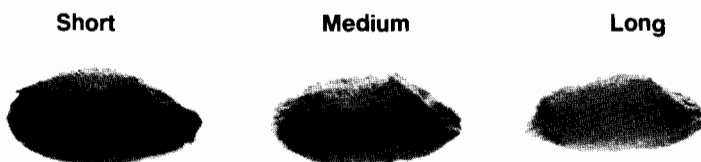
However, dimensions are suggested to give an indication of size ranges: *Short*, less than 6 mm long; *medium*, 6–6.5 mm; *long*, over 6.5 mm.

### 6.3 Grain width

<b>Narrow</b>	<b>Medium</b> (3.3 to 3.6 mm)	<b>Wide</b>
---------------	----------------------------------	-------------

Judge grain width as seen looking down on the back of the grain. Class as narrow or wide only if obviously so. These dimensions provide a guide to classification: *Narrow*, under 3.3 mm wide (e.g. Cook); *medium*, 3.3–3.6 mm; *wide*, greater than 3.6 mm (e.g. Teal).

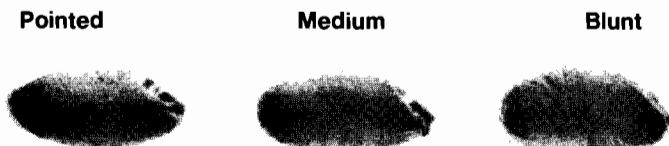
### 6.4 Brush length



Brush length is best viewed from the side of the grain, possibly with the help of a magnifying glass. Class as *long* or *short* only if obviously so. In general, durum wheats have very short brush hairs, Insignia wheats have quite short hairs, Gabo-type wheats tend to have well developed brush hairs.

As the brush hairs can be damaged and partly lost (as wheat dust) during dressing and mechanical handling, previous treatment of the sample should be borne in mind when assessing this character. This type of damage is most evident in very dry conditions.

### 6.5 Brush-end profile



This character describes the shape of the brush-end of the grain as seen from the side. It is a measure of the height of the brush area, but at the same time it reflects the shape of the back and base near the brush. Thus, for example, a level back and a straight base accompany a very *blunt* brush end, whereas a *pointed* grain could well have a sloping back and curved base.

### 6.6 Germ width

The germ is, strictly, the embryonic plant on the seed. In most varieties there are several humps or bulges on the germ. For the purposes of the varietal descriptions these bulges are called the embryo, while the word germ refers to the whole area. As the germ develops earlier than the bulk of the grain, it is almost always normal in size even in shrunken grain. Therefore, since germ width tends to be assessed in relation to the size of the whole grain, this character depends on the extent of grain filling. (From Symes 1958.)

Look down on the grain almost end-on to the germ. If the flat of the germ obviously covers most of the end of the grain it is classed as *wide germ* (e.g. Timgalen). In a grain with a *narrow germ*, much of the normal grain surface is showing at the end surrounding the germ (e.g. Lance).

Narrow



Medium



Wide



### 6.7 Height/width ratio

This character describes the ratio of the height to the width of the whole grain seen in outline in end-view (either from germ or brush end). *Low* indicates greater width than height; *high* indicates greater height than width.

Low



Square



High



### 6.8 Colour

Light



Medium



Dark



All wheats grown commercially in Australia are classified in the world trade as white. Thus the division into red and white, so useful in other classification schemes, does not apply. Nevertheless, Australian wheats show a range of colours, grading from very pale creamy white (*light*), through to shades of amber or brown (*dark*). However, colour is not a particularly reliable character, since it is susceptible to bleaching by sun and rain and is dependent on texture (vitreous grains tend to look darker).

### 6.9 Grain texture                      Opaque                      Intermediate                      Vitreous

Texture is evident in the appearance of the whole grain, where it contributes to grain colour, but it is best assessed on the cut grain. *Opaque* grains are white and mealy inside. *Vitreous* grains tend to break rather than cut cleanly, and the cut surface looks horny and translucent. The farinator is a useful aid for quickly cutting and examining fifty grains at once. This character is markedly affected by seasonal variation.

### Awns and glumes (see Section 5)

Since grain samples are rarely completely cleaned, the presence of large pieces of awns (more than 3 cm long) can be a useful clue to identity. However, absence of awns from a grain sample might mean that the wheat has no awns, has small awns or that the sample of an awned variety was thoroughly cleaned. In view of this element of uncertainty, this character is rated rather low in importance for grain samples. The presence of awns is a reliable character for the varieties that are listed as fully awned under head characters (5.2).

Incomplete cleaning also leaves some chaff with the grain, so that the range of characters for outer glumes (listed as head characters 5.1, 5.7 to 5.10) may be applied. Glume colour is the most useful of these. Check for possible mechanical damage to the glumes and make sure that outer glumes are examined. The outer glumes have a distinct keel (raised ridge or fold) along the back, but the lemma and palea lack this structure.

### Secondary grain characters

Primary grain characters are listed above roughly in order of importance and reliability. Various other characters are distinctive for certain varieties and are mentioned in specific cases, but in general these secondary characters tend to be more variable or less obvious than the main ones.

*Back section.* Indicate if back is prominently ridged.

**Ridge  
absent**



**Ridge  
present**





*Grain shape.***Elongated****Truncated****Oval****Ovate**

Look directly down on the back of the grain. The grain is described as *ovate* or egg-shaped when its broadest part is at the shoulder, and the grain profile slopes inwards to the brush end. *Oval* grains are broadest at the middle and taper in towards both ends. In *elongated* grains the sides are parallel or nearly so. If in addition the grain is short, it is classed as *truncated*.

*Grain size.* Indicate if the overall grain is either particularly *large* or *small*, e.g. the Warimba grain is large; Timgalen and Festiguay grains are small.

*Angle of germ face (side view).***Shallow****Steep**

Class as *shallow* if the angle of the germ face (the scutellum, not the wrinkled germ itself) is considerably less than  $45^\circ$  to the horizontal as the grain sits on its base (e.g. Halberd), or as *steep* if the angle is greater than  $45^\circ$  (e.g. Songlen, Festiguay).

*Tufted brush.* The brush for a few wheats (e.g. Glenwari) is tufted, with a small group of long hairs in the centre of the brush area.

*Brush width.* This character is judged as the width of the brush area seen from above (dorsal view), and is classed as narrow or wide.

**Collar.** The collar, if present, is a slightly raised ridge at the edge of the brush area, most noticeable on the crease side. Class as absent, present or distinct.

**Skin.** Grains of a few varieties, including Gamanya, have a characteristically *roughly* crinkled skin. On the other hand, a number of wheats have particularly *smooth* skinned grain. These include Olympic and Cook. However, this characteristic can be subject to considerable seasonal variation.

**Collar  
absent**



**Collar  
present**



**Back shape.** The profile of the back seen from the side as the grain lies on its base may appear *level* (if the back is horizontal), *sloping* (if the back slopes down in an almost straight line) or *curved* (for a back line that is markedly curved). The back is *humped* if it continues to slope upwards above the germ face.

**Base shape.** This character is also observed from the side with the grain sitting on its base. Class as *straight* if the base runs fairly straight for much of the length. A *round* base is a continuous curve for the full length with the base touching at only one point. The *incurved* base, characteristic of Duramba, touches at the extremes of the base and rises slightly in the centre.

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## PLANTS

## Summary Key to 3-6 Leaf Stage

Variety	1.1	1.2	1.3	1.4	1.5
	Auricle	Habit	Leaf length	Leaf width	Leaf pubescence
	s smooth h hairy	p prostrate i intermed. e erect	s short m medium l long	n narrow m medium w wide	l light m medium a abundant
Harrier	s	p	m	m	m a
Teal	s	p i	m	m	m a
Duramba	s	p i	m l	m	l
Terra	s	i	s	m	a
Miling	s	i	m	m	l
Festiguay	s	i	m l	m	l m
Tincurrin	s	i	m l	m	l m
Eagle	s	i	m l	m	m
Flinders	s	i	l	m	l m
Kite	s	i e	m l	m	m a
Hybrid Titan	s	i e	l	m	l
Wialki	s	e	s	w	l m
Banks	s	e	m	n	l
Bodallin	s	e	m	m w	l
Gamenya	s	e	m l	w	m
Madden	s	e	m l	w	m
Durati	s	e	l	m w	l
Warimba	s	e	l	m w	m a
Cook	s h	i	m	n	m a
Condor	s h	i e	m l	m	l m
Katylil	h	p	s	m	m a
Isis	h	p	m	n	l
Olympic	h	p i	m l	n m	l m
Shortim	h	i	s	n m	m
Eradu	h	i	s	m	l
Sunkota	h	i	s	m w	l m
Jacup	h	i	s m	m	l m
Egret	h	i	m	n m	l m
Oxley	h	i	m l	n m	l m
Kewell	h	i	m l	n m	m
Aroona	h	i	l	m	m
Avocet	h	i	l	m w	m
Timgalen	h	i e	s m	m	l m
Lance	h	i e	s m	m	m
Halberd	h	i e	m	m	l
Bindawarra	h	i e	m	w	m
Gatcher	h	i e	m l	m w	m
Warigal	h	e	m	m	m
Millewa	h	e	m	m w	m a
Canna	h	e	m l	w	l m
Songlen	h	e	l	m w	m a

## PLANTS

## Summary Key to 6-8 Leaf Stage

Variety	2.1	2.2	2.3	2.4	2.5
	Auricle	Habit	Leaf length	Leaf width	Leaf pubescence
	s smooth h hairy	p prostrate i intermed. e erect	s short m medium l long	n narrow m medium w wide	l light m medium a abundant
Harrier	s	p i	m	n	m
Teal	s	i	s m	m	m a
Duramba	s	i	m l	n m	l
Flinders	s	i	l	n	l m
Terra	s	i e	s	n	a
Kite	s	i e	m	n m	m
Miling	s	i e	m l	n	l
Festiguay	s	i e	m l	n	m
Eagle	s	i e	m l	n m	m
Warimba	s	e	m	m	m a
Madden	s	e	m	m w	m
Wialki	s	e	m	w	m
Gamenya	s	e	m l	m w	m
Banks	s	e	l	n	l
Tincurrin	s	e	l	m w	l
Bodallin	s	e	l	m w	l
Durati	s	e	l	m w	l
Hybrid Titan	s	e	l	w	m
Cook	s h	i	s m	n	m a
Condor	s h	e	m	n m	l m
Isis	h	i	s m	n	l
Shortim	h	i	s m	n	l m
Katylil	h	i	m	n	m
Olympic	h	i	m l	n m	m
Avocet	h	i	l	n	m
Egret	h	i e	s m	n	l m
Oxley	h	i e	m	n	l m
Jacup	h	i e	m	m	l m
Kewell	h	i e	m l	n	l m
Sunkota	h	e	s m	m	l
Lance	h	e	s m	n m	l m
Bindawarra	h	e	m	n	m a
Millewa	h	e	m	m	m
Songlen	h	e	m	m	m a
Eradu	h	e	m	m	l
Timgalen	h	e	m l	m	m
Halberd	h	e	m l	m	l
Gatcher	h	e	m l	m w	m
Warigal	h	e	l	n	m a
Aroona	h	e	l	m	m a
Canna	h	e	l	m w	l

## Summary Key to Head Descriptions

Variety	5.1 Glume colour	5.2 Awns	5.3 Head cross- section	5.4 Head side view	5.5 Head density	5.6 Head length	5.7 Glume beak length	5.8 Glume shoulder	5.9 Glume length	5.10 Glume width
	w white b brown	t tip h half f full	f flattened s square	o oblong i interm. t tapering	d dense m medium l lax	s short m medium l long	s short m medium l long	o oblique l level e elevated	s short m medium l long	n narrow m medium w wide
Miling	w	t	f	i	m	l	m	e	l	n
Lance	w	t	f	i	m l	m l	m	l	l	n
Olympic	w	t	f	t	d m	m	l	l e	s m	n m
Katylil	w	t	f	t	d m	l	l	l e	m	n m
Kewell	w	t	s	i	d	m	l	l e	m	w
Isis	w	t	s	i	d m	m	m	o e	m	n m
Wialki	w	t	s	t	m	m	s m	l	m	w
Madden	w	t h	s	i	d m	m	m	l	m	m
Festiguay	w	t h	s	o	d m	s m	s m	l	s m	m
Eagle	w	h	f	i	l	l	s	l	m	m
Bindawarra	w	h	f	i	l	l	m	e	m l	m
Kite	w	h	f	t	l	l	s	l	m	m w
Teal	w	h	s	o	m	m	s m	o l	s m	m
Gamenya	w	h	s	i	d m	m	s m	l	m	n m
Bodallin	w	f	f	o	m	m l	l	l e	l	n m
Avocet	w	f	f	o i	m l	l	l	l e	l	n m
Harrier	w	f	f	i	m l	l	l	l	l	m w
Banks	w	f	f	i t	m	m l	l	l	l	n
Flinders	w	f	f	i t	m	l	l	l	l	m
Oxley	w	f	f	t	d	m	l	o l	m	n

Songlen	w	f	f	t	d	m	m		e		n	m	
Condor	w	f	f	t	d	m	m		o	e	m		n
Shortim	w	f	f	t		m	s		e	e	m		n
Gatcher	w	f	f	t		m	sm		e	e	m		n
Timgalen	w	f	f	t		m	sm		e	e	m		n
Cook	w	f	f	t		m	m		e	e	m		n
Egret	w	f	f	t		m	m		o	e	m		n
Warimba	w	f	f	t		m	m						m
Warigal	w	f	f	t		m			o				n
Jacup	w	f	f	t		m							n
Canna	w	f	f	t		m				e			n
Aroona	w	f	f	t		m				e	m		n
Duramba	w	f		t	d	m	m			e			n
Eradu	w	f	f	s	t	m	m						n
Sunkota	w	f	s	i		m							m
Durati	w	f	s	t	d		sm		e				w
Halberd	b	t	f	i	d	m	m	m			m		m
Terra	b	t	f	t				s			m		n
Hybrid Titan	b	h	f	i				m		e	m		m
Millewa	b	f	f	i		m		m		e	m		n
Tincurrin	b	f			d		s		o		m		n

### Summary Key to Grain Descriptions

Variety	6.1 Grain hardness	6.2 Grain length	6.3 Grain width	6.4 Brush length	6.5 Brush-end profile	6.6 Germ width	6.7 Height/ width ratio	6.8 Colour	6.9 Grain texture
	s soft h hard	s short m medium l long	n narrow m medium w wide	s short m medium l long	p pointed m medium b blunt	n narrow m medium w wide	l low s square h high	l light m medium d dark	o opaque i interm. v vitreous
Egret	s	s m	m	s	p m	m	s	l	o
Olympic	s	m	n m	s m	m	m	s	l	o
Tincurrin	s	m	m	m	m	n m	s h	l	o
Katyil	s	m	m	m	m	m w	h	m	o i
Gamenya	s	m	m	m l	p m	m w	l s	m	i
Isis	s	m	m w	l	p m	m	s	l	o
Canna	s	m l	m	s	m	m	l s	l	o
Kewell	s	m l	m	m	m	m	s	l	o
Teal	s	m l	m w	s m	m b	w	s h	l	o
Lance	s	l	n m	m	p m	n	s	l m	o
Eradu	s	l	m	s	p m	m	s	l	o
Avocet	s	l	m	m	p	w	l s	m	o
Bindawarra	s	l	m	m	p m	n m	s	l	o
Jacup	s	l	m	m	m	n m	s	m	o
Festiguay	h	s	n m	m	b	m w	s	d	v
Timgalen	h	s m	n	m	p	w	s h	d	v
Sunkota	h	s m	n m	s	b	w	s	d	v
Banks	h	m	n	s	m	m	s h	m	i
Cook	h	m	n	s	m	m	s h	m d	v
Millewa	h	m	n	s	b	m	s	m	v



Condor	h	m	n m	s	m	n m	s h	m d	i v
Halberd	h	m	n m	s	b	m	s	m	v
Shortim	h	m	n m	m	p m	m w	s	m d	v
Songlen	h	m	n m	m	p m	m w	s h	m d	v
Aroona	h	m	m	m	p	m	s	m	i v
Wialki	h	m	m	m	p m	m w	s	m d	v
Madden	h	m	m	m l	m	m w	l s	m d	v
Gatcher	h	m	m	l	p	m w	s	m	v
Eagle	h	m l	n m	m	p m	m	l s	d	v
Kite	h	m l	n m	m	m	m	s h	d	v
Flinders	h	m l	m	s	m	m	s	d	v
Duramba	h	l	n	s	p m	w	s	d	v
Terra	h	l	n	s m	m	n	h	m d	v
Warigal	h	l	n	m	p m	m	h	m	v
Oxley	h	l	n m	s m	p	m	l s	l m	i
Harrier	h	l	n m	s m	m	w	h	d	v
Miling	h	l	n m	m	m	m	s h	m d	v
Durati	h	l	m	s	m	m	h	d	v
Warimba	h	l	m	s m	m	m	l s	m	i v
Bodallin	h	l	m	s m	m	m w	s	m	v
Hybrid Titan	h	l	m	m	m	w	s	l m	i

# Eradu

*Pedigree* Ciano/Gamenya

*Registration data* 1981, by W.A. Department of Agriculture

*Abbreviation* Eradu

*Maturity* Early

*Pathogen resistance* Stem rust (Sr5, Sr8 and further unidentified resistance)

*Quality type* Multipurpose wheat

*Growth sites* W.A.

## Plant characters

### 1. 3-6 leaf stage

- 1.1 Auricle — hairy
- 1.2 Habit — intermediate
- 1.3 Leaf length — short
- 1.4 Leaf width — medium
- 1.5 Leaf pubescence — light

### 3. Flowering

See head characters, Sections 5.2, 5.4 to 5.10

- 3.1 Top auricle height — medium
- 3.2 Flag leaf length — long
- 3.3 Flag leaf width — wide

### 2. 6-8 leaf stage

- 2.1 Auricle — hairy
- 2.2 Habit — erect
- 2.3 Leaf length — medium
- 2.4 Leaf width — medium
- 2.5 Leaf pubescence — light

Light green, straight leaves

### 4. Maturity

See head and grain characters, Sections 5 and 6

- 4.1 Plant height — short
  - 4.2 Straw strength — strong
- Thick straw, medium to semi-solid

ADD COMMENTS applicable to locality and season to cover any variations from these general descriptions:

# Eradu



## 5. Head characters

- 5.1 Glume colour — white
- 5.2 Awns — fully awned
- 5.3 Head cross-section — flattened to square
- 5.4 Head, side view — tapering
- 5.5 Head density — medium
- 5.6 Head length — medium
- 5.7 Glume beak length — long
- 5.8 Glume shoulder — level
- 5.9 Glume length — long
- 5.10 Glume width — narrow to medium

## 6. Grain characters

- 6.1 Grain hardness — soft
  - 6.2 Grain length — long
  - 6.3 Grain width — medium
  - 6.4 Brush length — short
  - 6.5 Brush-end profile — pointed to medium
  - 6.6 Germ width — medium
  - 6.7 Height/width ratio — square
  - 6.8 Colour — light
  - 6.9 Grain texture — opaque
- Steep germ face