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IDENTIFYING THE GRAIN OF BARLEY VARIETIES IN WESTERN AUSTRALIA

By J. L. McMULLAN, Plant Breeder, and H. M. FISHER, Adviser, Wheat and Sheep Division

The identification of varieties of plants depends on the existence of a number of visual characters which have recognisably different forms in different varieties, but are relatively unaffected by environmental conditions. For many species the characters of the whole plant may be required to arrive at a satisfactory identification and seed must be grown and the resulting plants compared with known varieties.

But each year farmers submit many samples of cereal grains for identification of variety. Bulk handling authorities also may need to classify grain where segregation according to type is required.

Identification from the grain alone is usually more difficult, but in the case of barley there are a number of grain characters which enable varieties to be classified into a large number of groups. In many cases differentiation of a single variety is possible from examination of the grain.

Characters used in identification

The barley grain is composed of—

- the KERNEL, to which is attached a papery covering consisting of two parts
- the LEMMA, which is the dorsal covering and of which the awn or beard is part, and
- the PALEA, which covers the ventral side of the grain and which is overlapped by the lemma.

In the centre of the palea is the ventral crease and in this lies a very fine appendage called the rachilla. Underneath the lemma at the base of the grain are two

It is sometimes necessary to be able to identify barley varieties, when only the threshed grain is available, where there is doubt about the identity of seed for sowing or offered for sale. This article describes some barley grain characteristics, which have been used for the identification of the major barley varieties in Western Australia. A key based on these characteristics is also given.
minute wing-like appendages known as the lodicules.

The position of these structures is shown in the diagram.

The combinations of the appearance and size of these parts can be used to distinguish many varieties. The major forms are discussed below:

**GRAIN SHAPE**

It is possible to distinguish 2-row from 6-row varieties by differences in grain shape. All the grains of 2-row varieties are symmetrical, but only one-third of the grains of a 6-row variety are regular in shape. This is related to the number of rows of grain which develop in a barley head. In 6-row barleys, grains develop in groups of three on a single spikelet, and only the central grain is symmetrical. The grains on each side (lateral grains) are noticeably flattened on the side next to the central grain, and rounded on the other side. In 2-row barleys the lateral grains fail to develop.

Grains of 2-row varieties have a broad and rounded base, while those of 6-row varieties are more narrow and tapered, particularly the lateral grains.

**VENTRAL CREASE**

A distinct crease, running the full length of the grain can be seen in the middle of the ventral (front) side of each grain. Varieties of barley differ in the degree of openness of this crease.

**LEMMA TEETH**

Lemma teeth are minute projections which may be felt as a roughness on the surface of the lemma. When present, they are only found on the nerves of the lemma and usually only at the apex of the grain.

There are five nerves on each lemma—The mid-nerve is in the middle of the lemma and is nearly always without teeth. The nerves on either side are the lateral nerves and these usually carry the most
All grains of two-row barleys are symmetrical. In six-row barleys two-thirds of the grains (lateral grains) are slightly twisted and asymmetrical teeth, if any are present. The two remaining marginal nerves are near the two margins of the lemma.

LEmma BASE SHAPE

Two distinct types of lemma base shape are distinguishable. In one type a depression can be seen above the point of attachment of the kernel. This type is most often found in lax-headed varieties.

The second type has a distinct transverse fold at the same place on the base of the lemma as the depression mentioned above. It is most often found in dense headed varieties and is thought to be caused by the mechanical stress which is developed as the grains become crowded as they fill.

RACHILLA LENGTH AND HAIRINESS

The rachilla varies in length, but it is rarely longer than one third the length of the grain. It is covered with small hairs which vary in length and fineness.

The rachilla, seen lying in the ventral crease, varies in length and hairiness. Left: long with short hairs; Right: short with long hairs.
Differences in width of ventral crease. Open (left); medium (centre); closed (right)

**LODICULES**

For the lodicules to be seen clearly, the lemma must be removed and a hand lens used. The size and number of hairs on the lodicules are useful in the identification of varieties.

**Identifying common varieties**

The grain characteristics of major barley varieties in Western Australia are indicated in the Table below. Some characters are more useful than others for differentiating between varieties. The information appearing in the Table has been transformed to a key which is based on initial allocation of an unknown grain sample to groups which are most easily recognised visually. Subsequently the identification is narrowed to sub groups, using characters which are less easily defined and which may involve use of a hand lens to be seen.

**Distinctive grain of Dampier barley**

The 2-row variety Dampier is readily classified because it is one of the few local barleys with a compact head, and associated with this is a distinct fold at the base of the grain. Dampier may, therefore, be readily distinguished from Prior,
<table>
<thead>
<tr>
<th>Visual Identification</th>
<th>Description of Major Variation</th>
<th>Variety</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TWO-THIRDS OF GRAINS TWISTED AND ASYMMETRICAL</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Rachilla *long* with *short, medium-fine* hair  
Prominent teeth on *lateral* lemma nerve  
*Blue* grain | **SIX-ROW**  
Atlas |
| Rachilla *short* with *long fine* hair  
Prominent teeth on *lateral and marginal* nerves  
*White* grain | Beecher |
| **NO TWISTED GRAINS—ALL SYMMETRICAL** |
| Lemma base, transverse fold *present* | **TWO-ROW**  
Dampier |
| Lemma base, transverse fold *absent*  
Rachilla long with *long fine* hair  
Ventral crease *closed*  
Lodicule *medium* size, *very hairy* | Maltworthy |
| Ventral crease *medium-closed*  
Lodicule *large* size, *moderately hairy* | Proctor |
| Rachilla long with *short fine* hairs  
Ventral crease *open*  
Lodicule *medium size, short fine* hairs | Bussell |
| Ventral crease *medium-closed*  
Lodicule *large* size, *long coarse* hairs | Prior |
### GRAIN CHARACTERS OF MAJOR BARLEY VARIETIES

<table>
<thead>
<tr>
<th>Variety</th>
<th>Type (rows)</th>
<th>Grain colour</th>
<th>Lemma (dorsal side)</th>
<th>Rachilla</th>
<th>Ventral crease</th>
<th>Lodicule</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Teeth</td>
<td>Transverse fold</td>
<td>Hair length and fineness</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Long</td>
<td>Short</td>
<td>Medium Closed</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Short</td>
<td>Medium</td>
<td>Medium Closed</td>
<td></td>
</tr>
<tr>
<td>Atlas</td>
<td>6</td>
<td>Blue</td>
<td>Prom. (L.)</td>
<td>Semi</td>
<td>Short Medium</td>
<td>Large</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hairy</td>
</tr>
<tr>
<td>Beecher</td>
<td>6</td>
<td>White</td>
<td>Prom. (L. &amp; M.)</td>
<td>Semi</td>
<td>Long Fine</td>
<td>Large</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Hairy</td>
</tr>
<tr>
<td>Bussell</td>
<td>2</td>
<td>White</td>
<td>Few (L. &amp; M.)</td>
<td>Absent</td>
<td>Short Fine</td>
<td>Open</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Medium</td>
</tr>
<tr>
<td>Dampier</td>
<td>2</td>
<td>White</td>
<td>Few (L.)</td>
<td>Present</td>
<td>Short Coarse</td>
<td>Closed</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Small</td>
</tr>
<tr>
<td>Prior</td>
<td>2</td>
<td>White</td>
<td>Few (L. &amp; M.)</td>
<td>Absent</td>
<td>Short Fine</td>
<td>Medium Closed</td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Large</td>
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<tr>
<td>Proctor</td>
<td>2</td>
<td>White</td>
<td>None</td>
<td>Absent</td>
<td>Long Fine</td>
<td>Medium Closed</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>Large</td>
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<tr>
<td>Malworth</td>
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<td>White</td>
<td>None</td>
<td>Absent</td>
<td>Long Fine</td>
<td>Closed</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Medium</td>
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</table>


which has a shallow depression rather than a fold at the base of the grain.

To assess the value of this means of differentiation a test was carried out using six observers of varying experience, and up to 26 samples of threshed barley grain, half of which were Dampier and half Prior. The tests demonstrated that it was possible for experienced observers to distinguish these varieties accurately with the naked eye, and to record almost 100 per cent. accuracy using a small hand lens.

**Acknowledgments**

The assistance of Messrs. J. A. Parish and J. D. Smith in providing grain samples of Prior and Dampier and arranging for the identity tests, is acknowledged. Also of Messrs. K. W. Swan, A. Davis and K. Xanthis who assisted by making identifications which tested the key.

**References**


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