Wheat variety trials on research stations, 1952

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To test the suitability under local conditions of the newer wheat varieties, whether bred in this State or introduced from the Eastern States, variety trials are conducted each year on five wheatbelt research stations. The results of these trials indicate the varieties most suitable to the various areas of the wheatbelt and serve as a guide to the farmer in the choice of the most suitable varieties to grow.

The development by the plant breeder of wheat varieties suited to Western Australian conditions is playing an important role in the present prosperity and current development of the wheatbelt. Such varieties as Bungulla and Bencubbin, with their high yields and drought resistance, have already greatly helped the farmer. Today, with increasing acreages being laid down to subterranean clover, also with cultivation of large areas of newly cleared "light" land, the requirements are for varieties more adapted to present conditions.

For the so-called "light lands", both straw strength and high flour quality are important, while for clover-ley areas straw strength is again a major consideration.

SEASONAL CONDITIONS AT RESEARCH STATIONS

The rainfall figures for each of the five stations are summarised in Table No. 1:

<table>
<thead>
<tr>
<th>TABLE 1.</th>
<th>Rainfall at Research Stations, 1952-53 Season.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Station</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avondale, 1952</td>
<td>243</td>
<td>242</td>
<td>372</td>
<td>130</td>
<td>132</td>
<td>102</td>
<td>1,221</td>
</tr>
<tr>
<td>Average, 26 yrs</td>
<td>209</td>
<td>232</td>
<td>299</td>
<td>224</td>
<td>104</td>
<td>78</td>
<td>1,239</td>
</tr>
<tr>
<td>Chapman, 1952</td>
<td>224</td>
<td>196</td>
<td>323</td>
<td>98</td>
<td>114</td>
<td>67</td>
<td>1,023</td>
</tr>
<tr>
<td>Average, 47 yrs</td>
<td>229</td>
<td>414</td>
<td>389</td>
<td>259</td>
<td>143</td>
<td>87</td>
<td>1,523</td>
</tr>
<tr>
<td>Merredin, 1952</td>
<td>139</td>
<td>70</td>
<td>204</td>
<td>44</td>
<td>88</td>
<td>102</td>
<td>647</td>
</tr>
<tr>
<td>Average, 42 yrs</td>
<td>134</td>
<td>187</td>
<td>182</td>
<td>148</td>
<td>79</td>
<td>73</td>
<td>803</td>
</tr>
<tr>
<td>Salmon Gums, 1952</td>
<td>79</td>
<td>89</td>
<td>142</td>
<td>23</td>
<td>102</td>
<td>185</td>
<td>620</td>
</tr>
<tr>
<td>Average, 27 yrs</td>
<td>130</td>
<td>149</td>
<td>144</td>
<td>142</td>
<td>102</td>
<td>115</td>
<td>783</td>
</tr>
<tr>
<td>Wongan Hills, 1952</td>
<td>229</td>
<td>139</td>
<td>264</td>
<td>94</td>
<td>127</td>
<td>99</td>
<td>952</td>
</tr>
<tr>
<td>Average, 27 yrs</td>
<td>180</td>
<td>259</td>
<td>261</td>
<td>198</td>
<td>92</td>
<td>70</td>
<td>1,060</td>
</tr>
</tbody>
</table>

Annual Total:
- Avondale, 1952: 1,466
- Average, 26 yrs: 1,564
- Chapman, 1952: 1,144
- Average, 47 yrs: 1,787
- Merredin, 1952: 914
- Average, 42 yrs: 1,167
- Salmon Gums, 1952: 1,227
- Average, 27 yrs: 1,339
- Wongan Hills, 1952: 1,072
- Average, 27 yrs: 1,396
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As for several years now, the trials at Avondale, Chapman and Wongan Hills were planted on clover-ley land which was prepared for planting immediately prior to seeding. At the other stations plots were planted on land which had been fallowed. Conditions at the individual stations are briefly outlined below:

**Avondale**—Planting was carried out under favourable conditions. Growing conditions were good and finishing rains in October resulted in above-average crops. Some damage was done at maturity by stormy conditions and high winds.

**Chapman**—Opening rains were good, enabling planting to be carried out under suitable conditions; however the following rains were infrequent and coupled with high winds caused below-average yields.

**Merredin**—Normal May rainfall enabled planting to be carried out satisfactorily, but lack of June rains resulted in an uneven germination with a final germination occurring with good soaking rains in July. Rainfall continued below average and beneficial falls in the second week of October came too late to be of much benefit to the maturing crops; consequently, yields were below normal.

**Salmon Gums**—Below average falls occurred in May; these were insufficient for good germination. Cold weather and lack of rain further retarded crops so that good finishing rains in October and November could not fully benefit the crops and yields were low.

**Wongan Hills**—Planting conditions were reasonably satisfactory but lack of further good rains adversely affected germination and subsequent growth. The rains of mid-October enabled the crops to mature and yield reasonably satisfactorily.

**DISEASE RESISTANCE**

During the last season, no major changes occurred in this State in respect to flag smut or stem rust.

**Flag Smut**—All varieties under test on the research stations, with the exception of Gabo and the new crossbred M.108, are resistant to this disease.

**Stem Rust**—The efforts of plant breeders have received set-backs on at least two occasions by the appearance of new rust races soon after the widespread cultivation of rust-resistant varieties. With the general cultivation of Eureka in New South Wales, there appeared rust race 126B attacking it. Similarly the 1948 complex of races appeared after the introduction of the varieties Yalta, Kendee, Gabo and Charter, which until then had been regarded as rust-resistant.

In Western Australia, the Eureka and Wongoondy attacking race (race 126B) has been isolated from collections extending over several years, so that these two varieties are now liable to be attacked in any future epidemic, although to date race 126B has only been isolated from other than these two varieties. The complex of races first discovered in N.S.W. in 1948 has apparently not yet arrived in this State and varieties attacked by these races, such as Gabo, Yalta, Bencubbin 48, Javelin 48 and Insignia 49, can still be regarded as rust-resistant here.

In addition, the varieties Dowerin, Festival, Warigo, Panther and the new crossbreds M.107, M.108, M.109 and M.112 are resistant to all stem rust races known to be present in Australia.

Although stem rust epidemics are infrequent in this State, the growing of rust resistant varieties in a year of bad rust infection may mean the difference between normal yields and total crop failure.

**FLOUR STRENGTH**

The plant breeder today is vitally concerned with the flour quality (baking strength) of his selections. The result has been, in most cases, an improvement in this characteristic and the relatively newer, better quality varieties such as Eureka, Wongoondy, Kondut and Gabo are now being grown
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on an increasing proportion of the wheatbelt. In this State, these and other varieties of medium strong and strong flour quality in 1946 were sown on 4% of the total area grown to wheat, in 1949 10% while in 1951 they had increased to 22%.

However, the flour quality of any variety, whether normally classed as weak or strong, is considerably influenced by soil and climatic conditions. The climate is not yet under man’s control, but soil conditions are, and the farmer can considerably influence his soil fertility by his rotational practices and by the growing of suitable legumes, particularly subterranean clover. It cannot be too strongly stressed that varieties can only express their inherent quality to the fullest when grown under suitable climatic and soil conditions.

In Table 2 are tabulated the major characteristics of wheat varieties under trial, including their flour quality and disease resistance.

**DISCUSSION OF RESULTS**

For the convenience of discussion, it is usual for the cereal growing areas to be divided into three major zones according to rainfall. Zone 1 covers districts with less than 14in. rainfall, Zone 2 those recording 14in. to 18in., and Zone 3 those with over 18in.

In Zone 1 are located the Merredin and Salmon Gums Research Stations and experimental evidence from these two stations can be applied to the low rainfall areas of the eastern wheatbelt and to the more limited areas of the southern mallee, respectively.

Wongan Hills, although in Zone 2, is close to the boundary of Zone 1, and is

<table>
<thead>
<tr>
<th>Variety</th>
<th>Produced by</th>
<th>Maturity</th>
<th>Flag Smut Resistance</th>
<th>Stem Rust Resistance</th>
<th>Grain Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bungulla</td>
<td>W.A. Dept. of Agriculture</td>
<td>Very early</td>
<td>Highly resistant</td>
<td>Susceptible</td>
<td>State f.a.q.</td>
</tr>
<tr>
<td>Bencubbin</td>
<td>do. do.</td>
<td>Midseason</td>
<td>do. do.</td>
<td>do.</td>
<td>Medium strong</td>
</tr>
<tr>
<td>Kondut</td>
<td>do. do.</td>
<td>Late midseason</td>
<td>do. do.</td>
<td>do.</td>
<td>Above State f.a.q.</td>
</tr>
<tr>
<td>Dowerin</td>
<td>do. do.</td>
<td>Early midseason</td>
<td>Resistant</td>
<td>Resistant</td>
<td>Premium strong</td>
</tr>
<tr>
<td>Wongoondy</td>
<td>do. do.</td>
<td>Early</td>
<td>Highly resistant</td>
<td>Now liable in W.A.</td>
<td>do. do.</td>
</tr>
<tr>
<td>Eureka</td>
<td>N.S.W. Dept. of Agriculture</td>
<td>Midseason</td>
<td>Resistant</td>
<td>Susceptible</td>
<td>State f.a.q.</td>
</tr>
<tr>
<td>Gabc</td>
<td>Sydney University</td>
<td>Early</td>
<td>Resistant in W.A.</td>
<td>do. do.</td>
<td>State f.a.q.</td>
</tr>
<tr>
<td>Benuobbin</td>
<td>Waite Research Institute</td>
<td>Midseason</td>
<td>Susceptible</td>
<td>do. do.</td>
<td>State f.a.q.</td>
</tr>
<tr>
<td>Insignia 49</td>
<td>do. do.</td>
<td>Early</td>
<td>do.</td>
<td>do. do.</td>
<td>State f.a.q.</td>
</tr>
<tr>
<td>Insignia</td>
<td>Victorian Dept. of Agriculture</td>
<td>do. do.</td>
<td>do.</td>
<td>Susceptible</td>
<td>State f.a.q.</td>
</tr>
<tr>
<td>Yalta</td>
<td>N.S.W. Dept. of Agriculture</td>
<td>Midseason</td>
<td>Highly resistant</td>
<td>Restistant in W.A.</td>
<td>Premium strong</td>
</tr>
<tr>
<td>Warigo</td>
<td>Waite Research Institute</td>
<td>do.</td>
<td>do.</td>
<td>do. do.</td>
<td>Medium strong</td>
</tr>
<tr>
<td>Panther</td>
<td>do. do.</td>
<td>Late midseason</td>
<td>Resistant</td>
<td>Medium strong to</td>
<td>Medium strong</td>
</tr>
<tr>
<td>Festival</td>
<td>N.S.W. Dept. of Agriculture</td>
<td>Early midseason</td>
<td>do.</td>
<td>Above premium strong</td>
<td>Premium strong</td>
</tr>
<tr>
<td>M. 107</td>
<td>W.A. Dept. of Agriculture</td>
<td>do. do.</td>
<td>do.</td>
<td>do.</td>
<td>Medium strong</td>
</tr>
<tr>
<td>M. 108</td>
<td>do. do.</td>
<td>do. do.</td>
<td>Moderately susceptible</td>
<td>do.</td>
<td>Medium strong</td>
</tr>
<tr>
<td>M. 109</td>
<td>do. do.</td>
<td>do. do.</td>
<td>Highly resistant</td>
<td>do.</td>
<td>Premium strong</td>
</tr>
<tr>
<td>M. 112</td>
<td>do. do.</td>
<td>Midseason</td>
<td>do.</td>
<td>do.</td>
<td></td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th></th>
<th>AVONDALE.</th>
<th>CHAPMAN.</th>
<th>MERREDIN.</th>
<th>SALMON GUMS.</th>
<th>WONGAN HILLS.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yield.</td>
<td>Percentage of Control</td>
<td>Yield.</td>
<td>Percentage of Control</td>
<td>Yield.</td>
</tr>
<tr>
<td>Midseason Maturing Varieties for Early Planting—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Benubbin</td>
<td>26.2</td>
<td>100%</td>
<td>4.6</td>
<td>100%</td>
<td>13.0</td>
</tr>
<tr>
<td>Kondut</td>
<td>29.8</td>
<td>100%</td>
<td>5.1</td>
<td>110%</td>
<td>12.5</td>
</tr>
<tr>
<td>Benubbin 48</td>
<td>27.3</td>
<td>104%</td>
<td>3.9</td>
<td>85%</td>
<td>13.2</td>
</tr>
<tr>
<td>Warigo</td>
<td>23.6</td>
<td>90%</td>
<td>4.2</td>
<td>90%</td>
<td>12.6</td>
</tr>
<tr>
<td>Javelin 48</td>
<td>25.6</td>
<td>98%</td>
<td>4.1</td>
<td>88%</td>
<td>13.6</td>
</tr>
<tr>
<td>Panther</td>
<td>30.1</td>
<td>115%</td>
<td>5.1</td>
<td>100%</td>
<td>11.0</td>
</tr>
<tr>
<td>Eureka</td>
<td>24.9</td>
<td>95%</td>
<td>5.7</td>
<td>123%</td>
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<tr>
<td>Yalta</td>
<td></td>
<td>0.3%</td>
<td>6</td>
<td>Not significant</td>
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<tr>
<td>Difference for Significance — P = .05</td>
<td>3.2</td>
<td>12</td>
<td></td>
<td>Not significant</td>
<td>0.6</td>
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<tr>
<td>Early-midseason Maturing Varieties—</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benubbin</td>
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<td>100%</td>
<td>11.6</td>
<td>100%</td>
<td>13.8</td>
</tr>
<tr>
<td>Eureka</td>
<td>8.9</td>
<td>100%</td>
<td>15.2</td>
<td>100%</td>
<td>10.3</td>
</tr>
<tr>
<td>Dowerin</td>
<td>9.8</td>
<td>111%</td>
<td>13.5</td>
<td>117%</td>
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<tr>
<td>M. 107</td>
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<td>117%</td>
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<td>117%</td>
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<td>M. 108</td>
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<td>119%</td>
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<td>119%</td>
<td>10.8</td>
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<tr>
<td>M. 112</td>
<td>9.3</td>
<td>105%</td>
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<td>105%</td>
<td>7.1</td>
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<tr>
<td>Difference for Significance — P = .05</td>
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<td>1.5</td>
<td>13</td>
<td>1.2</td>
</tr>
<tr>
<td>Early Maturing Varieties for Late Planting—</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benubbin</td>
<td>12.0</td>
<td>100%</td>
<td>13.1</td>
<td>100%</td>
<td>10.5</td>
</tr>
<tr>
<td>Insignia 50</td>
<td>22.6</td>
<td>98%</td>
<td>15.9</td>
<td>99%</td>
<td>10.7</td>
</tr>
<tr>
<td>Dowerin</td>
<td>22.9</td>
<td>99%</td>
<td>16.7</td>
<td>114%</td>
<td>11.7</td>
</tr>
<tr>
<td>Insignia</td>
<td>15.2</td>
<td>67%</td>
<td>18.7</td>
<td>121%</td>
<td>11.1</td>
</tr>
<tr>
<td>Woongoomdy</td>
<td>19.2</td>
<td>83%</td>
<td>16.3</td>
<td>105%</td>
<td>11.8</td>
</tr>
<tr>
<td>Festival</td>
<td>14.9</td>
<td>97%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difference for Significance — P = .05</td>
<td>1.0</td>
<td>7</td>
<td>0.7</td>
<td>4</td>
<td>0.8</td>
</tr>
</tbody>
</table>

N.B.—Figures in brackets indicate the number of years under trial.
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typical of large areas of light heath
plain occurring in many areas of the
State. Also in Zone 2 are the Chapman
and Avondale Research Stations, the
former being situated on the northern
eges of the wheatbelt, and the latter
being typical of the west central and
upper great southern districts.

The yielding ability of varieties under
trial are summarised in Table 3. In the
midseason and late maturing varieties,
Bencubbin is used for the control, while
the standard for early maturing vari-
eties is Bungulla.

**MIDSEASON AND LATE MATURING
VARIETIES**

Two new varieties, Javelin 48 and
Panther, were tested for the first time.
Both varieties at Avondale, and Javelin
48 only at Merredin, gave yields equal
to the control variety, Bencubbin; else-
where the yields were somewhat disap-
pointing. They will, however, be tested
again in 1953.

Except at Chapman, where its yields
were low, the results of two seasons' trials have shown that the rust-
resistant Bencubbin 48 is capable of yielding as well as Bencubbin itself.
Apart from rust-resistance, it is almost identical with Bencubbin, and it can therefore be recommended in rust-
able areas in place of Bencubbin.

The variety Warigo continues to be rather disappointing in yield and in this respect appears to be an unsuitable variety except perhaps in the western areas of the wheatbelt; the yield at Avondale only being the same as that of the control variety.

Both Kondut and Eureka have again yielded exceptionally well at Avondale and Chapman, the yields of Eureka signi-
ificantly exceeding those of Bencubbin at the two stations, while Kondut out-yielded the control at Chapman. This indicates the suitability of these two varieties in the higher rainfall areas of Zone 2. Although none of the re-
search stations is situated in Zone 3, it is considered that these two varieties would be more suitable for early plant-
ing in this zone than other midseason varieties.

**EARLY MATURING VARIETIES**

For the first time, Insignia and the rust-resistant Insignia 49 were grown together. At the three stations, Avon-
dale, Merredin and Salmon Gums, their yields were identical, whereas at both Chapman and Wongan Hills Insignia outyielded Insignia 49.

At Salmon Gums in 1952, Bungulla outyielded Insignia 49, while at Chap-
man, Merredin and Wongan Hills both Insignia and Insignia 49 gave higher yields than the control. At the other centre, Avondale, yields of all three varieties were equal.

Over a two season average, both Insignia and Insignia 49 have either yielded as well as, or better than Bun-
gulla; showing that they are capable of high yields under a wide range of soil and climatic conditions. Although no better in flour quality than Bun-
gulla, Insignia 49 with its good straw strength, high yield and rust-resistance should prove a useful variety in this State.

At Avondale the three varieties, Dowerin, Gabo and Wongoondy, were outyielded by Bungulla. This is not normal as the progressive average shows that both Wongoondy and Gabo normally outyield Bungulla at this station. The low yields of these three varieties was probably due to a succes-
sion of severe frosts in September, which may have caught the three vari-
eties at a particularly susceptible stage.

Except for Gabo at Salmon Gums, both Gabo and Wongoondy at the other stations were either equal to Bungulla or superior to it. As they have desir-
able agronomic characters, they can be recommended for all zones of the wheatbelt. Dowerin appears to require better finishing conditions in spring and is therefore only recommended in the better rainfall areas, that is, in Zones 2 and 3.
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### TABLE 4.

#### Recommended Varieties.

<table>
<thead>
<tr>
<th>Maturity Group</th>
<th>Zone 1 (Early)</th>
<th>Zone 2 (Midseason)</th>
<th>Zone 3 (Late)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Less than 14in. Annual Rainfall</td>
<td>14in. to 18in. Annual Rainfall</td>
<td>Over 18in. Annual Rainfall</td>
</tr>
<tr>
<td>Midseason</td>
<td>Bencubbin, Bencubbin 48</td>
<td>Kondut, Eureka, Bencubbin 48, Eureka, Yalta</td>
<td>Kondut, Eureka, Bencubbin 48, Yalta</td>
</tr>
<tr>
<td>Early</td>
<td>Wongoondy, Gabo</td>
<td>Wongoondy, Gabo, Dowerin</td>
<td>Wongoondy, Gabo, Dowerin</td>
</tr>
<tr>
<td>Very Early</td>
<td>Bungulla</td>
<td>Bungulla</td>
<td>Bungulla</td>
</tr>
</tbody>
</table>

For Zone 3 also, both Gabo and Wongoondy can be regarded as suitable early-maturing varieties for late planting.

The new rust-resistant variety Festival was tested at Chapman for the first time, where its yield was equal to that of the control variety.

As a guide, the recommended varieties for each zone have been listed in Table 4.

### NEW CROSS-BRED VARIETIES

Four new cross-bred varieties developed at the Merredin Research Station were included in large-scale variety trials for the first time. M.107, M.108, and M.109 are the result of selections from a cross between Kenya C.6041 and Eureka 11, while M.112 resulted from a cross between Eureka 11 and M.61 (Sword x Kenya C.6041). The Kenya parent was used for its rust resistance and Eureka principally for flour quality and straw strength.

In these cross-breds an endeavour has been made to combine together the important characteristics of strong straw, disease resistance, high flour quality and high yield. Most of the varieties in popular use today are deficient in at least one of these major characteristics.

The results are somewhat variable for at Chapman, three of the cross-breds, M.107, M.108, and M.109, gave higher yields than the Bencubbin control, but were in turn all outyielded by Eureka, one of the varieties they have been designed to replace.

At Merredin and Wongan Hills, respectively, M.109 and M.107 gave yields equal to the control variety; apart from these two instances, yields have been somewhat disappointing. However, the results are for one year's trial only and further trials will be necessary before conclusions as to yield are arrived at.

### ACKNOWLEDGMENTS

This opportunity is taken of expressing thanks to the managers and staff of the research stations for their assistance in conducting the above trials.
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