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Cereal Variety Trials

Results of 1951 Trials at Research Stations

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EACH year cereal variety trials are conducted on the wheatbelt research stations with the object of determining the most suitable varieties which can be recommended for planting under Western Australian conditions.

The location of the five wheatbelt research stations is such that the results obtained from trials on these stations present a reasonably overall picture for the wheatbelt and the farmer is able, by comparison with his own soil and climatic conditions, to translate the results for himself.

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

It will be noted that rather varied conditions were experienced at the research stations this year, with only one station, Chapman, receiving normal growing period rainfall. Three stations

had well below average recordings, while the remaining station, Salmon Gums, had both growing period and annual falls well above the average.

Generally the growing period rainfall was satisfactory until August, but a rather dry spring adversely affected growth and yield of crops—particularly at Merredin.

TABLE 1.

Station.	Jan.	Feb.	Mar.	Apl.	Growing Period Rainfall.							Nov.	Dec.	Annual Total.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
Avondale—														
1951	12	190	....	365	70	379	146	105	33	46	779	53	160	1,559
Av. 25 yrs.	24	40	88	86	207	328	296	228	103	77	1,239	56	34	1,567
Chapman—														
1951	23	49	15	264	129	590	444	249	118	56	1,586	15	33	1,985
Av. 46 yrs.	25	37	63	78	229	418	391	263	144	88	1,533	40	25	1,801
Merredin—														
1951	50	287	11	158	67	246	140	93	30	47	623	170	156	1,455
Av. 41 yrs.	40	55	86	86	134	189	181	151	80	72	807	44	55	1,173
Salmon Gums—														
1951	323	230	81	126	173	338	98	134	343	46	1,132	53	138	2,083
Av. 26 yrs.	86	85	127	88	132	151	144	147	103	112	789	90	78	1,343
Wongan Hills—														
1951	115	63	11	220	81	284	212	124	76	19	796	34	53	1,292
Av. 26 yrs.	35	43	88	95	179	262	261	202	91	69	1,064	46	38	1,409

At Avondale, Chapman and Wongan Hills these trials were planted on land which had been under subterranean clover for a number of years and which was prepared for planting immediately prior to seeding. At Salmon Gums and Merredin the plots were planted on land which had been fallowed. Conditions at the individual stations are briefly outlined below:—

AVONDALE.—Heavy April rains and a drier May enabled planting to be carried out under favourable conditions. Finishing rains were poor and were followed by heavy falls and high winds in early December which caused damage and crop losses.

CHAPMAN.—Planting was carried out under favourable conditions until early in June when a very wet period caused water-logging, but only light finishing rains fell in October.

MERREDIN.—Cropping operations were carried out under good conditions, but, after June, growth was retarded by cold and lack of good finishing rains in September and October. Mild conditions in October and general absence of hot drying winds enabled the crops to mature and yield better than anticipated.

SALMON GUMS.—Late summer and autumn rains caused heavy growth of weeds, however, despite this, planting took place under favourable conditions. Wet weather then set in and heavy falls in September caused the appearance, on susceptible varieties, of wheat stem rust.

WONGAN HILLS.—Good openings rains in April permitted an early start with ploughing but a comparatively dry May made seeding operations somewhat difficult. Subsequent growing period falls were considerably below average, however, despite the lack of finishing rains, crops matured well and yields were above average.

WHEAT VARIETY TRIALS

The development of wheat varieties suited to West Australian conditions has played a very important part in the extension and consolidation of the wheat-belt. New varieties produced in this State and promising new varieties from other States are included in the large scale field trials to compare them with existing varieties. In these trials the two standard varieties Bencubbin and Bungulla are used as controls—Bencubbin in the midseason and Bungulla in the early maturing variety sections respectively.

TABLE 2.

Variety.	Produced by.	Maturity.	Flag Smut Resistance.	Stem Rust Resistance.	Grain Quality.
Bungulla	W.A. Dept. of Agriculture	Very early	Highly resistant	Susceptible	State f.a.q.
Bencubbin	do.	Midseason	do.	do.	do.
Kondut	do.	Late midseason	Resistant	do.	Approaching premium strong.
Eureka	N.S.W. Dept. of Agriculture	Midseason	Moderately resistant	Now liable in W.A.	do. do.
Wongoondy....	W.A. Dept of Agriculture	Early	Highly resistant	do.	do. do.
Gabo	Sydney University	do.	Susceptible	Resistant in W.A.	do. do.
Kendee	do.	Early midseason	Resistant	do.	Medium strong.
Yalta	N.S.W. Dept. of Agriculture	Midseason	Highly resistant	do.	Premium strong.
Bencubbin 48	Waite Research Institute	do.	Resistant	do.	State f.a.q.
Insignia 49	do.	Early	do.	do.	do.
Dowerin	W.A. Dept. of Agriculture	Early midseason	do.	Resistant in all States	Above State f.a.q.
Warigo	Waite Research Institute	Midseason	Highly resistant	do. do.	Medium strong.

Disease Resistance

Flag Smut.—This disease is no longer regarded as being of great importance due to the effective control given by resistant varieties. However, in the event of large areas being sown to susceptible varieties, the disease could reach epidemic proportions again.

Stem Rust.—Stem rust is composed of numerous physiological races, which differ in the varieties which they are capable of attacking. The position regarding the more important rust races in Australia has been summarised in a previous issue of this Journal (Thomas and Watson, 1950). Since then it has been definitely confirmed that, Race 126B which attacks Eureka and its derivatives such as Wongoondy, is present in this State.

A further complex of races, isolated in New South Wales in 1948 has not yet reached Western Australia. This means that varieties such as Gabo, Kendee, Yalta, Bencubbin 48 and Insignia 49, although susceptible in the Eastern States are still resistant here.

The Western Australian variety Dowerin is resistant to all these races.

In addition promising new crossbreds with the same Kenya C6041 type of resistance will be included in variety trials this coming season.

Flour Strength

To meet the demand for a wheat suitable to the baking trade and to raise the general standard of Western Australian wheat, the plant breeder is concerned with the flour quality (baking strength) of his selections. Most of the recent wheat releases are an improvement in this characteristic on existing varieties which are commonly grown. It is stressed, however, as in former reports on wheat variety trials, that varieties can only express their inherent quality to the fullest when grown under suitable climatic and soil conditions. The climatic conditions cannot be altered but the farmer can influence his soil fertility by his rotational practices and by the growing of suitable legumes.

The disease resistance and baking quality of the varieties under test are summarised in Table 2 while their yielding ability is summarised in Table 3.

TABLE 3.

WHEAT VARIETY TRIALS AT RESEARCH STATIONS, 1951-52 SEASON.

	AVONDALE.			CHAPMAN.			MERREDIN.			SALMON GUMS.			WONGAN HILLS.		
	Yield.	Percentage of Control.		Yield.	Percentage of Control.		Yield.	Percentage of Control.		Yield.	Percentage of Control.		Yield.	Percentage of Control.	
		1951.	Aver- age.		1951.	Aver- age.		1951.	Aver- age.		1951.	Aver- age.		1951.	Aver- age.
Midseason and Late Midseason Maturing Varieties for Early Planting—	bus. lb.	%	%	bus. lb.	%	%	bus. lb.	%	%	bus. lb.	%	%	bus. lb.	%	%
Bencubbin	29 7	100	100	10 51	100	100	11 46	100	100	18 46	100	100	14 40	100	100
Eureka	31 34	108	(8)108	11 20	104	(8)100	7 34	64	(7) 81	22 18	119	(8) 90	19 35	134	(7) 97
Kondut	27 29	94	(8)104	11 55	110	(8)100	7 48	66	(7) 75	16 45	89	(8) 86	17 15	118	(7) 94
Yalta	25 12	87	(4) 94	10 3	93	(5)103	8 52	75	(4) 77	18 59	101	(4) 96	15 44	103	(4) 87
Bencubbin 48.....	26 0	89	.....	9 28	87	.....	9 28	80	.....	20 58	112	.....	15 20	104	.....
Warigo	27 14	94	.....	12 30	115	.....	.....	.....	.....	.....	.....	.....	13 3	89	.....
Difference for significance— P = .05	1 18	5%	.....	No significant difference			0 47	7%	.....	2 3	11%	.....	0 35	5%	.....
Early Maturing Varieties for Late Planting—															
Bungulla	24 29	100	100	.....	.....	100	9 18	100	100	7 28	100	100	21 34	100	100
Gabo	28 3	115	(5)119	.....	.....	(5) 92	9 36	103	(6) 93	7 2	94	(5) 99	18 34	86	(5) 95
Kendee	25 15	103	(5)113	.....	.....	(5) 84	6 44	72	(6) 83	6 58	93	(5) 96	19 20	90	(5) 96
Dowerin	23 28	96	(5)105	.....	.....	(5) 86	7 12	77	(6) 85	8 22	112	(3) 95	15 7	70	(4) 84
Wongoodny	30 8	123	(6)119	.....	.....	(5) 95	9 8	98	(6) 96	9 23	126	(6)105	18 50	87	(6) 94
Insignia 49 .....	.....	.....	.....	.....	.....	.....	8 16	89	.....	10 30	141	.....	18 58	88	.....
Difference for significance— P = .05	2 0	8%	.....	.....	.....	.....	1 12	13%	.....	2 7	28%	.....	0 43	3%	.....

N.B.—Figures in brackets indicate the number of years under trial.

Discussion of Results

In the discussion of these experimental results it is desirable that they be treated on the basis of the division of the cereal growing areas into three zones. This division is on the basis of rainfall.

Zone 1 includes those districts with less than 14 in. of annual rainfall; Zone 2, those recording 14 in. to 18 in. and Zone 3 those with over 18 in.

The Merredin and Salmon Gums Research Stations are situated in Zone 1 and experimental evidence obtained from the former can be considered applicable to quite a large area of the eastern wheat belt and lower rainfall areas and from the latter for the specific conditions of the Southern Mallee.

Wongan Hills, though included in Zone 2, lies close to the boundary of Zone 1 and is typical of very large

areas of light heath plain which is found in the State. The Avondale Station is typical of the west central and upper great southern districts, and Chapman for the Northern districts which lie in Zone 2.

Midseason and Late Maturing Varieties.

In this section a recent introduction, Bencubbin 48, was tested for the first time and Warigo, which was tested some years ago, was again included at several of the research stations. It will be seen from Table 3 that the yields of Bencubbin 48 were comparatively good at Salmon Gums and Wongan Hills and with Warigo at Chapman. On the other stations the yields for both these varieties were, by comparison, low but they will, however, be again included in the trials this coming season.

From the results at Merredin the variety Bencubbin is still the superior midseason variety for Zone 1 due to its

ability to yield well under dry conditions. Though Bencubbin 48, which is rust-resistant in this State, yielded better than the other three midseason maturing varieties, Yalta, Eureka and Kondut, it has yet to prove equal to Bencubbin itself. In the more westerly and on the lighter types of soil of Zone 1 Yalta, Eureka and Kondut are capable of producing good yields.

In Zone 2 results from Avondale, Chapman and Wongan Hills indicate that the other midseason varieties are capable of yielding as well as Bencubbin, whilst for a number of years Eureka and Kondut at Avondale and Yalta at Chapman have yielded slightly better than Bencubbin.

None of the agricultural research stations is situated in Zone 3 but it is considered that in Zone 3 and in the higher rainfall areas in Zone 2 where, there is a high proportion of clover-ley land and, in many districts, the potential danger of a rust epidemic, strong strawed rust-resistant varieties are desirable. In these areas Kondut, though not rust-resistant, must be considered a suitable variety on account of its good straw strength, superior grain quality and potentially high yielding ability. Eureka and Yalta can also be recommended having regard to the results at Avondale and Chapman.

Early Maturing Varieties

In this section the rust-resistant variety Insignia 49 was included for the first time but, except at Salmon Gums, did not show promise. Like Insignia itself, its flour quality is no better than that of Bungulla and is definitely inferior to such varieties as Wongoondy, Gabo and Kendee.

At Salmon Gums the rust-resistant varieties have yielded satisfactorily over a period of years with Dowerin and Wongoondy returning good yields this year. The standard variety Bungulla has yielded consistently over the years and is still recommended generally for this zone. Wongoondy must now be

considered rust-labile in the presence of race 126B but with its superior grain quality and strong straw is recommended as an alternative variety to Bungulla for this zone, particularly for the lighter soil types and districts where the incidence of rainfall is more favourable. Under Salmon Gums conditions rust-resistant varieties are most desirable, if not essential.

Gabo is still rust-resistant in this State and though susceptible to flag smut possesses superior grain quality and strong straw and is another useful variety, particularly where the finishing conditions tend to be somewhat above average.

In Zone 2, the trial at Chapman unfortunately had to be cancelled owing to water-logging but the progress percentages up to 1950 have been included in Table 3 for comparison purposes. It will be noted from Table 3 that Bungulla has consistently yielded somewhat better than the other varieties under test except at Avondale where all the rust-resistant varieties are at least equal if not superior to it.

The yielding ability and other desirable characteristics of Wongoondy and Gabo do, however, support their recommendation for this zone particularly as within it there are large areas of clover-ley land. Dowerin, which is early mid-season in maturity must be given some consideration on account of the fact that it is resistant to all known races of stem rust in Australia and would, therefore, be a useful variety to grow in areas such as the lower Great Southern where rust epidemics are feared.

As indicated in the comments covering the midseason varieties little information is available for Zone 3 but the same general comments apply for the early as well as the later maturing varieties. Further, from the Avondale results such varieties as Wongoondy and Gabo can be confidently recommended.

In Table 4 the recommended varieties for each Zone have been listed having regard to the comment made.

TABLE 4.

Maturity Group.	Zone 1 (Early).	Zone 2 (Midseason).	Zone 3 (Late).
	Less than 14in. Annual Rainfall.	14in. to 18in. Annual Rainfall.	Over 18in. Annual Rainfall.
Midseason	Bencubbin	Kondut Bencubbin Eureka Yalta	Kondut Eureka Yalta Bencubbin
Early	Wongoondy Gabo	Wongoondy Gabo Dowerin	Wongoondy Gabo Dowerin
Very Early	Bungulla	Bungulla	Bungulla

OAT VARIETY TRIALS

The oat variety trials for grain are conducted on the wheatbelt research stations with the object of determining the most suitable varieties which can be recommended for planting under Western Australian conditions.

The trials, the results of which are set out in Table 5, are sown on a three-plot system, which enables each variety to be harvested as it matures and reduces the possibility of variation in yields due to the earlier-maturing varieties shedding before the later varieties are ready for harvesting.

TABLE 5.

Variety.	Maturity.	Grain Yield.	Per cent. of Control.	
			1951.	Average.
Wongan Hills Research Station—		bus. lb.	%	%
Late Planted Trial:				
Ballidu	Early	36 6	100	100
Orient	Early	38 29	107	105 (2)
Wongan	Very Early	26 22	73	87 (2)
Early Planted Trial:				
Guyra	Midseason	20 37	100	100
Dale	Midseason	29 16	140	145 (2)
Algerian	Late	24 30	118	134 (2)
Merredin Research Station—				
Late Planted Trial:				
Ballidu	Early	8 2	100	100
Orient	Early	8 6	101	113 (2)
Wongan	Very Early	6 10	78	79 (2)
Salmon Gums Research Station—				
Late Planted Trial:				
Ballidu	Early	8 37	100	....
Orient	Early	12 37	144	....
Wongan	Very Early	8 11	93	....

Number of trials indicated in brackets.

These trials, consisting of a new series beginning in 1950, had to be cancelled at Salmon Gums that year, so that at that station figures are available for one season only.

For grain yields in the late planted trials, Orient, an oat released in 1947 by the Victorian Department of Agriculture, is equal to or slightly better than the West Australian variety Ballidu. Orient, of parentage Palestine x Dawn, is an early-maturing, short-strawed variety suitable for grazing and recovery for grain. The variety, Wongan, in all trials has been out-

yielded by Ballidu but it is a valuable variety due to its very early maturity and vigorous early growth.

In the early planted trial at Wongan Hills, Dale has given markedly superior yields to Guyra. It is capable of giving satisfactory results as a general purpose variety under a wide range of conditions. Algerian is also a useful general purpose variety, particularly in the wetter districts of the cereal-growing areas.

The recommended varieties for each Zone are listed in Table 6.

TABLE 6.

Maturity Group.	Zone 1 (Early).	Zone 2 (Midseason).	Zone 3 (Late).
	Less than 14in. Annual Rainfall.	14in. to 18in. Annual Rainfall.	Over 18in. Annual Rainfall.
Midseason and Late	Dale Guyra	Dale Guyra Algerian	Dale Guyra Algerian
Early	Ballidu Orient	Ballidu Orient	Ballidu Orient
Very Early	Wongan	Wongan	Wongan

BARLEY VARIETY TRIALS

The barley variety trials (for grain only) are conducted each year at one centre, Avondale, this location being

considered the most suitable one for the testing of both two-row and six-row types.

The yields are set out in Table 7—

TABLE 7.

BARLEY VARIETY TRIAL FOR GRAIN, 1951-52 SEASON.

Variety.	Type.	Maturity.	Grain Yield.	Percentage of Control.	
				1951.	Average.
			bus. lb.	%	%
Prior	2-row	Early	26 12	100	100
Research	2-row	Early Midseason	32 37	125	117 (8)
Maltworthy	2-row	Early Midseason	33 8	126	121 (8)
Atlas	6-row	Early Midseason	27 43	108	119 (8)
Beecher	6-row	Early	40 10	153	....

N.B.—Number of trials are indicated in brackets.

Description of Varieties

Prior.—Of early maturity, it is the most important malting barley grown in Australia—it is also a useful variety for green fodder purposes.

Research.—A few days later-maturing than Prior it was produced by the Victorian Department of Agriculture. It produces grain satisfactory for malting purposes.

Maltworthy.—Produced by Roseworthy Agricultural College, South Australia, it is similar to Research.

Atlas.—Introduced from California this variety is a general purpose barley being suitable for early green feed, for feed grain and for malting.

Beecher.—A smooth-awned variety, result of a cross between Atlas and Vaughan. It was introduced from America.

In this State the two-row types are used for malting and the six-row types mainly for green feed, fodder grain or for export. Over a period of years the two-row varieties Research and Maltworthy have outyielded Prior. Maltworthy is a few days later in maturing than Prior and for good quality malting grain should not be sown in the "early" zone (Zone 1.) or the drier areas of the "midseason" zone (Zone 2.).

The six-row barley Beecher in one year's trial outyielded the variety Atlas, but from grazing and recovery trials conducted on several research stations it appears as if Beecher cannot be grazed as heavily as Atlas, if satisfactory grain yields are also to be obtained.

The recommended varieties and the purpose for which they should be grown in each zone are set out in Table 8.

TABLE 8.

Use.	Zone 1 (Early).	Zone 2 (Midseason).	Zone 3 (Late).
	Less than 14 in. Annual Rainfall.	14 in. to 18 in. Annual Rainfall.	Over 18 in. Annual Rainfall.
For Malting purposes—			
Local Trade .... {	....	Prior	Prior.
	....	Research	Research
	....	Maltworthy*	Maltworthy
Export Trade ....	....	Atlas	Atlas
For Fodder Grazing and Grain	Atlas	Atlas	Atlas

* Higher Rainfall Districts only.

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