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EFFECT OF PLANTING TIME ON THE YIELD OF WHEAT AT BILOELA RESEARCH STATION IN CENTRAL QUEENSLAND

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SUMMARY

Trials conducted over a 12-year period at Biloela Research Station in Central Queensland showed that wheat planted in May and June gave consistently better yields than wheat planted outside these months. Earlier plantings faced the risk of frost damage during the susceptible stages of growth. Later plantings resulted in poor yields, mainly due to a drier growing season.

I. INTRODUCTION

This long-range trial programme was initiated in 1955 because of very high wheat yields from May plantings being reported over several years by local grain-growers. The investigations were designed to supply information on the optimum planting times for wheat in the district.

II. MATERIALS AND METHODS

The trials were conducted over the years 1955 to 1967 inclusive, with the exception of 1961 when plantings had to be abandoned through the lack of suitable planting rainfall. There was considerable variation in treatments over the trial period, because in the initial stages reliance was placed on rainfall for sufficient planting moisture. The range of plantings considered was over the months of April, May, June, July and August. Variation in trial sites was also necessary to suit the overall Research Station programme. Table 1 shows the trials conducted.

In 1964 a preplanting irrigation of 1 in. was applied to the trial area to allow establishment. Preplanting irrigation was also applied to the May, July and August treatments in 1965 and to the April and May treatments in 1967. All other plantings were made on rainfall.

The major climatological conditions influencing the results of the investigation, viz. frost and rainfall, are given in Tables 2-4.

TABLE 1

TRIALS CONDUCTED

Trial No.	Year	Variety	Planting Rate lb/ac.	Design	Planting Date														
					April			May			June			July			August		
					Early	Mid	Late	Early	Mid	Late	Early	Mid	Late	Early	Mid	Late	Early	Mid	Late
I	1955*	Gabo ..	3 trials ..	1 3 x 7 R.B.				6			1				19				
		Spica ..	May (1) 40	2 3 x 3 R.B.															
		Pusa 4 ..	June (2) 44	3 3 x 3 R.B.															
			July (3) 50																
II	1956	Gabo ..	May 62–66	(3x2) x 7 R.B.				8						2	18				
		Celebration	June 53																
			July 67																
III	1957	Gabo ..	50	3 x 7 R.B.							5		26			22			
IV	1958	Gabo ..	50	3 x 7 R.B.					21			18			15				
V	1959†	Spica ..	50	3 x 7 R.B.						28		16		1					
VI	1960	Spica ..	50	3 x 7 R.B.				5		31			27						
VII	1962	Spica ..	55	4 x 5 R.B.		18		9			11			2					
VIII	1963	Spica ..	50	3 x 5 R.B.		17				25									26
IX	1964	Spica ..	50	3 x 6 R.B.			20			27			29						
X	1965	Spica ..	50	5 x 4 R.B.	6			7					23			30		17	
XI	1966	Spica ..	41	5 x 4 R.B.	1			12				17		5			5		
XII	1967	Spica ..	41	5 x 4 R.B.			24			30			29			25			28

* Three separate variety trials were carried out in 1955, planted in May, June and July.

† The change from Gabo to Spica in 1959 was in line with a change in commercial plantings.

TABLE 2

NUMBER OF FROSTS RECORDED (TERRESTRIAL MINIMUM < 30·4°F)

Year	April	May	June	July	August	September	October	Lowest Temperature Recorded (°F)	Total for Year
1955	0	1	6	11	9	0	0	(June) 22·0	27
1956	0	1	9	6	14	8	0	(Aug.) 21·1	38
1957	0	5	0	13	4	4	2	(May) 19·0	28
1958	0	0	0	7	9	4	0	(Aug.) 22·2	20
1959	0	0	4	6	16	6	0	(Aug.) 20·0	32
1960	0	6	11	13	16	1	0	(June) 19·5	47
1962	0	4	7	9	19	1	0	(Aug.) 18·0	40
1963	0	0	7	23	1	6	0	(July) 13·2	37
1964	0	2	3	7	14	1	0	(Aug.) 22·0	27
1965	0	4	6	22	8	0	0	(July) 13·6	40
1966	0	4	4	16	5	0	0	(July) 18·1	29
1967	0	4	1	5	13	10	0	(Aug.) 22·0	33

TABLE 3

RAINFALL (POINTS) DURING TRIAL SERIES—TOTALS OF ALL FALLS

100 points = 1 in.

Year	April	May	June	July	August	Sept.	Oct.	Nov.	Total
1955 ..	183	467	18	154	36	17	375	121	1,371
1956 ..	406	114	195	283	10	62	56	445	1,571
1957 ..	21	0	89	122	71	0	323	202	828
1958 ..	186	13	465	10	76	22	116	79	976
1959 ..	123	181	0	174	0	46	335	295	1,154
1960 ..	98	193	59	86	51	23	220	414	1,144
1962 ..	361	211	68	120	71	167	33	141	1,172
1963 ..	61	41	50	2	312	14	27	122	629
1964 ..	51	81	107	396	129	256	453	117	1,590
1965 ..	401	19	100	5	14	117	59	127	842
1966 ..	103	84	291	135	278	93	311	280	1,575
1967 ..	20	94	445	94	148	0	320	417	1,538

TABLE 4

RAINFALL (POINTS) DURING TRIAL SERIES (TOTAL FALLS > 20 POINTS)*

Year	April	May	June	July	August	Sept.	Oct.	Nov.	Total
1955 ..	158	449	0	133	34	0	375	65	1,214
1956 ..	379	94	74	246	0	32	0	45	870
1957 ..	21	0	79	108	43	0	302	190	1,613
1958 ..	179	0	446	0	39	86	86	76	912
1959 ..	120	183	0	157	0	31	303	272	1,066
1960 ..	88	169	54	77	48	0	184	380	1,000
1962 ..	317	203	65	90	59	141	30	115	1,020
1963 ..	32	41	49	0	291	0	0	115	518
1964 ..	46	81	70	396	126	228	452	107	1,506
1965 ..	383	0	65	0	0	110	0	119	677
1966 ..	68	84	290	112	231	93	267	503	1,648
1966 ..	0	90	379	55	102	0	292	380	1,298

* The assumption is that an effective fall is 20 points or more.

III. RESULTS

Yields for the various treatments for the 12 trials are given in Table 5 and shown diagrammatically in Figure 1. Separate analyses were carried out on yields obtained from plantings with Spica and Gabo. These are presented in Table 6.

TABLE 5

MEAN YIELD DATA (BUS/AC)

Trail No.	April	May		June	July	August
I	..	Gabo	29·8	23·1	3·4	..
		Spica	22·3	21·5	4·5	..
		Pusa 4	17·9	19·4	1·2	..
II*	..		36·4	..	15·1 11·4	..
III	..		..	45·2 41·0	21·7	..
IV	..		3·3	5·7	0	..
V	..		17·9	31·2	17·6	..
VI	..		36·3 33·4	21·6	..	..
VII	31·9		30·9	34·3	26·6	..
VIII	5·6		22·2	..	..	2·0
IX	36·5		15·5	15·8	..	..
X	2·57		20·6	20·6	5·4	5·2
XI	4·9		28·5	11·9	9·1	0
XII	31·4		34·2	22·9	14·6	0

* Mean yield of two varieties: Celebration, Gabo

TABLE 6

MEAN YIELDS OBTAINED FROM SPICA AND GABO (BUS/AC)*

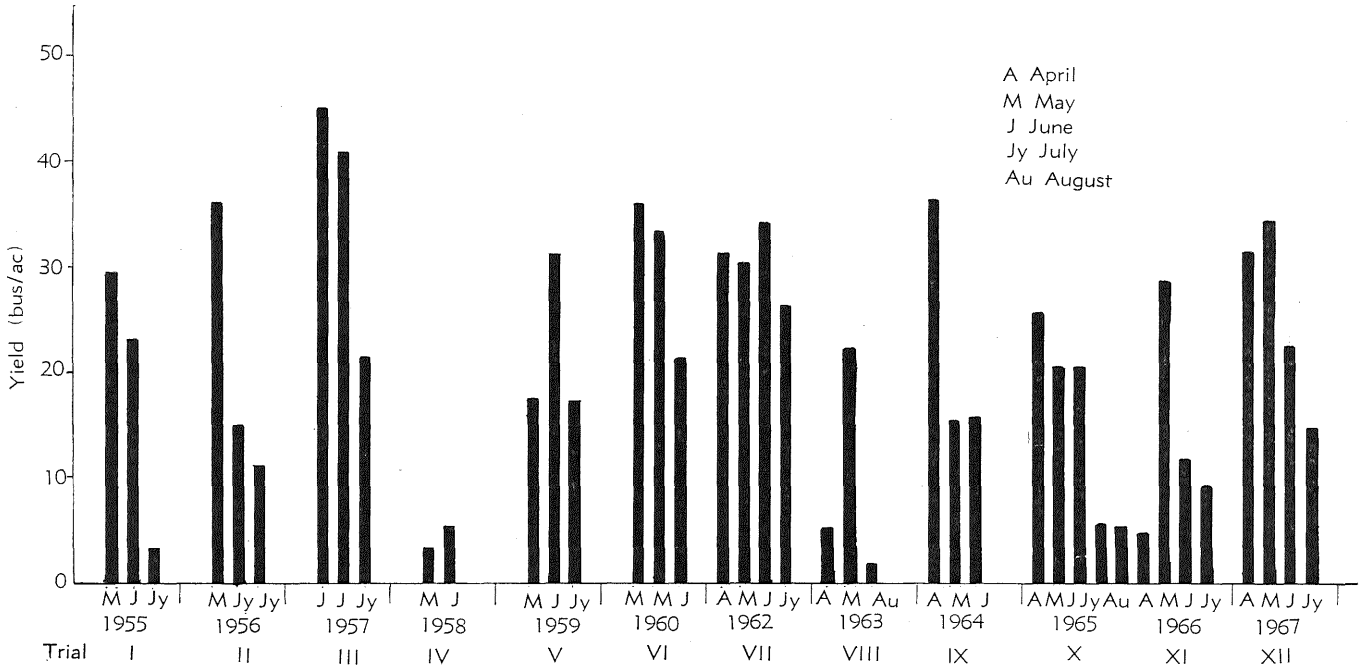
Treatment	Mean Yield of Spica	Treatment	Mean Yield of Gabo
1. April	23·5	1. May	28·3
2. May	25·6	2. June	26·2
3. June	21·4	3. July	9·2
4. July	12·5		
5. August	5·3		
S.E.	4·6	S.E.	5·4
Necessary differences for 5%	9·6	Necessary differences for 5%	14·9
significance 1%	13·1	significance 1%	24·7

* The means have been adjusted to allow for the non-orthogonal nature of the data.

IV. DISCUSSION

Though the planting rate was changed from time to time for various reasons, in the light of observations by Stevens (1965) it is considered that the variation would have had little or no effect on the overall results. Stevens reported that for the Biloela district any planting rate less than 40 lb/ac is too low at all planting dates. Rates above 50 lb are unnecessary for plantings made in May-June, but rates up to 70 lb produce yield increases sufficient to be economically payable when crops are planted late, i.e. in July. Stevens also pointed out that yield differences due to variable rates of seeding are not of primary importance. They are never great and are largely cancelled out by other factors such as stooling, size of head, moisture stored in the subsoil and rain during the growing period of the crop.

Fig. 1.—Yields (bus/ac) obtained over the trial period. The 1955 results are for Gabo and the 1956 results are the mean of Gabo and Celebration.



Main consideration has been given to the month in which wheat planting took place irrespective of the date within that month. The results show that plantings made in May and June consistently yield best, with occasional good yields being obtained from April plantings. A number of factors contributed to the yield differences obtained over the trial series.

In trial I, the unsound layout of the overall trials, each planting being in a separate block, detracted from the value of the results. Nevertheless, there is an indication that the May planting was superior to the June planting, though some head frosting occurred in the earlier planting. Extremely low yields resulted from the rainless growth period of July-planted wheat. Stem rust was also worst in the July planting.

In trial II, May planting significantly outyielded early July and late July planting. Lack of rain in the normally very dry months of August and September, and also in October, contributed largely to the poor yields obtained from the July plantings. Planting in July avoided frost incidence during heading, but wheat planted in May was subjected to frosts although without injury.

In trial III, earlier plantings again gave the highest yields, because of ample available moisture and freedom from rust. Frosts this year did not damage the crop.

In trial IV, though sufficient subsoil moisture was stored to produce a reasonably good crop, yields were very poor because of the incidence of rust. The early-planted wheat was slightly damaged by frost during August, whereas other plantings escaped frost damage.

In trial V, poor germination, particularly in the later planting, with the resulting poor stand detracted from the value of the results. Damage by mice to the early planting was severe. Insufficient rainfall contributed to the low yield from the July planting.

In trial VI, the early planting again yielded best. This planting suffered no major frost or rust damage. The late May planting experienced both moisture stress at flowering and frost damage and was slightly damaged by rust. The June planting suffered moisture stress at flowering. Although there was very little rainfall over the trial period, sufficient moisture had been stored up to planting to produce reasonable yields.

In trial VII, slight frost damage was experienced by all plantings, with the May planting suffering most damage. Yield of the July planting was lowered through moisture stress and rust. The incidence of rust in the later plantings was high. This was the first trial in which April plantings were attempted, and reasonable yields resulted.

In trial VIII, the April planting suffered from frost damage and dry conditions. The May planting, which avoided frost damage, produced a fair crop but yields were lower than normal because of the lack of rainfall. The August planting suffered from the dry late season and low yields resulted.

In trial IX, rainfall during the later part of the growing period was above average although late September-October rains were of little benefit to the almost mature crops. Greatest frost intensity and lowest temperatures occurred in late July to mid-August, when frosts occurred for up to nine consecutive days. The April planting gave the highest yield. Frost damage to the May planting was severe, and moisture stress and some rust damage also occurred. The June planting suffered most from moisture stress.

In trial X, conditions early in the season were favourable; however, frosts occurred later in the season and were followed by high temperatures and dry conditions. All plantings were frosted to some extent, with the May and June plantings suffering the most damage. Frosts and drought had a large influence on yield, severe drought affecting the August planting, although the April planting was not damaged very severely.

Trial XI was carried out over one of the best seasons experienced in the area for some time. Above-average rainfall was received in all months except April and May. Frosts occurred from May to late August, the most severe being in July, when they occurred on 13 days. Plantings made outside the month of May suffered in yield. Yields from the April and June plantings were low, as these were severely affected by frosts. Weed growth, the short height of the August planting and its very small yield prevented harvesting being carried out.

In trial XI, an attack of false wireworm (*Gonocaphalum macleayi*) thinned the stand in the April planting, which led to a reduced yield. Heavy rains at the end of the season resulted in severe weed infestation, and this associated with low yield and short height made harvesting of the August planting virtually impossible. Frosts, although occurring later than in previous years, did have some adverse effect on yields.

The results indicate that May and June plantings consistently yield best. Planting later than this period usually results in poor yields mainly due to a drier growing season, unreliable rains, rust incidence and forced earlier maturity with the onset of warmer weather. Earlier plantings, viz. April, have produced good yields; however, there is a considerable risk of frost damage during the susceptible stages of growth. There is therefore an element of luck involved when carrying out April plantings.

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