7. OTHER AGRONOMY TRIALS

7.1 WHEAT PHENOLOGY TRIAL (INVERLEIGH VIC)

Determining the Effect of Sowing Time on Wheat Yield and Grain Quality

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Acknowledgements:
Southern Farming Systems would like to thank the Grains Research and Development Corporation and Department of Primary Industries for their support.

Rainfall (2005): 500.8 mm
GSR: (Apr – Nov) 350.3 mm

Summary:
The trial demonstrated clearly that late May sowing gave higher wheat yields and better grain quality than late April and early July sowing. Some varieties such as the winter wheat MacKellar went against this trend, with higher yields being achieved with the late April sowing.

The highest yielding varieties also tended to spend more time in the vegetative phase (emergence to end of tillering) with an average length of 75 days. The poorest yielding varieties spent approximately 63 days in this period. The highest yielding varieties spent a shorter time in the construction phase (end of tillering to start of flowering) with an average time of 40 days. The poorest varieties spent 47 days on average in this period. The best varieties also had a short grain fill phase (start of flowering to grain physiological maturity), with an average time of 37 days compared to 56 days for the poorest yielding varieties.

Background:
It is unclear what growth characteristics we should be aiming for when breeding wheat for the high rainfall zone. Wheat varieties differ as to their response to various stimuli such as accumulation of temperature (day degrees), day length (photoperiod) and low temperatures (vernalisation). It is unclear as to how long wheat varieties should spend in the vegetative phase (emergence to end of tillering), construction phase (end of tillering to start of flowering) and grain fill period (start of flowering to grain physiological maturity) in order to maximize yield and grain quality.

Objectives:
To determine the impact of sowing date on wheat yield and grain quality across 20 different wheat varieties. To understand how yield and quality is affected by the amount of time spent within the 3 growth stages.

Methodology:
20 different varieties were sown at 3 different timings (28th April, 27th May and 4th July 2005) These varieties were sown in 5 metre plots (2 metres wide) and replicated twice. The trial was sown on raised beds.

Sowing dates:
28th April, 27th May and 4th July 2005
Seed rate adjusted for grain size with a target population of 200 plants per square metre.

Fertiliser:
At sowing 100 kg/ha MAP Cu (1.52%) Zn (1.16%)
Urea 100 kg/ha early sowing (18th Aug), mid sowing (1st Oct) and late sowing (14th Oct).

Fungicide:
Spray Opus 500 ml/ha applied 15/8 and 19/9 (early sowing), 18/8 and 19/9 (mid sowing) and 19/9 and 15/10 (late sowing).

Results and Discussion

Table 7-1: The Effect Of Sowing Date On Average Grain Yield And Quality Across The 20 Different Varieties

	Sown 28th April	Sown 27th May	Sown 4th July	LSD 5%
Yield T/Ha	4.768	5.671	4.335	0.476
Protein %	11.77	11.25	11.01	0.41
Grain Retention %[18]	96.13	97.18	96.65	0.68
Screenings %	3.90	2.94	3.36	0.68
Test Wt kg/hl	76.52	78.52	73.35	1.18
TGW grams[19]	39.45	41.83	37.79	1.21

[18] Grain retention is the percentage of grain above a 2.0 mm screen
[19] TGW is thousand grain weight corrected to 12.5 % moisture

Clearly the sowing on 27th May resulted in higher yields and better grain quality than the other 2 sowing dates. The only exception to this was grain protein, where the level declined as sowing times were later.

Some varieties such as MacKellar yielded less as sowing date was delayed. Kellalac maintained high yield as sowing date was delayed which may explain the reason for its wide acceptance across South West Victoria.

Table 7-2: Impact Of Sowing Time On Yield (T/Ha)

Variety	Name	April	May	July
1	Batavia	2.965	5.190	2.025
2	Carnamah	2.885	4.835	4.870
3	Chara	5.070	7.010	5.495
4	Gregory	3.945	3.365	2.180
5	Frame	3.760	4.275	4.135
6	Glover	4.015	4.690	2.345
7	Kellalac	5.070	6.325	6.400
8	LH71	6.395	7.575	6.115
9	MacKellar	6.980	5.725	4.910
10	Marombi	6.600	7.105	5.505
11	Matong	5.080	4.960	4.295
12	Oxley	4.235	5.785	5.140
13	Pastor	3.530	3.645	2.300
14	Silverstar	3.865	6.575	4.170
15	Sunbrook	3.925	5.020	4.590
16	Swift	4.780	5.560	5.235
17	Tennant	5.955	7.565	2.420
18	Wedgetail	5.290	5.560	5.280
19	Wyalkatcham	4.100	6.540	4.980
20	Wylah	6.920	6.115	4.320
Average		**4.768**	**5.671**	**4.336**
LSD 5%		**1.083**	**1.648**	**2.589**

As can be seen from Table 7-2, most varieties yielded best when sown in May, however some varieties such as MacKellar lost yield as sowing date was delayed.

Table 7-3: Impact Of Sowing Time On Grain Test Weight kg/hl

Variety	Name	April	May	July
1	Batavia	76.09	78.88	73.41
2	Carnamah	73.72	80.87	74.88
3	Chara	75.44	79.16	76.30
4	Gregory	79.36	79.63	72.64
5	Frame	79.26	81.70	72.81
6	Glover	79.65	82.11	73.97
7	Kellalac	78.41	80.52	72.80
8	LH71	70.51	75.79	73.74
9	MacKellar	77.09	77.52	69.49
10	Marombi	73.99	77.93	74.24
11	Matong	75.56	79.42	72.07
12	Oxley	76.90	77.14	74.74
13	Pastor	78.40	78.83	72.74
14	Silverstar	76.46	79.14	72.25
15	Sunbrook	76.62	81.29	76.23
16	Swift	74.08	78.60	73.68
17	Tennant	74.34	61.95	65.95
18	Wedgetail	77.16	78.47	73.59
19	Wyalkatcham	77.01	80.66	75.36
20	Wylah	80.44	80.76	76.03
Average		**76.52**	**78.52**	**73.35**
LSD 5%		**5.84**	**2.77**	**5.90**

As can be seen from Table 7-3, the May sowing for most varieties resulted in the highest grain test weight, although there were some exceptions.

Table 7-4: Impact Of Sowing Time On TGW

Variety	Name	April	May	July
1	Batavia	36.75	42.99	37.04
2	Carnamah	38.55	43.74	40.51
3	Chara	37.81	42.18	37.55
4	Gregory	43.49	42.74	39.60
5	Frame	36.38	40.09	39.47
6	Glover	41.93	44.45	36.57
7	Kellalac	40.11	40.69	33.62
8	LH71	35.59	44.09	36.43
9	MacKellar	33.92	37.17	33.66
10	Marombi	39.13	40.15	38.53
11	Matong	37.13	38.79	35.56
12	Oxley	35.50	38.53	40.61
13	Pastor	44.18	46.28	40.33
14	Silverstar	37.90	39.22	33.49
15	Sunbrook	39.68	40.65	35.93
16	Swift	37.40	36.31	36.58
17	Tennant	42.69	45.12	39.30
18	Wedgetail	41.02	40.50	35.83
19	Wyalkatcham	47.98	50.40	46.58
20	Wylah	41.92	42.61	38.51
Average		**39.45**	**41.83**	**37.79**
LSD 5%		**6.98**	**4.63**	**4.51**

Table 7-4 shows TGW to be highest for the May sowing.

Table 7-5: Impact of Sowing Time on Screenings

Variety	Name	April	May	July
1	Batavia	1.85	2.11	3.18
2	Carnamah	1.91	1.77	4.13
3	Chara	4.46	2.86	3.20
4	Gregory	4.36	5.49	5.56
5	Frame	2.88	2.81	2.54
6	Glover	1.94	2.44	3.77
7	Kellalac	1.95	2.67	2.04
8	LH71	7.22	3.49	2.42
9	MacKellar	9.05	6.56	5.49
10	Marombi	5.88	3.30	1.68
11	Matong	3.25	1.61	5.47
12	Oxley	4.28	3.21	2.13
13	Pastor	3.84	3.40	4.29
14	Silverstar	2.97	3.57	4.29
15	Sunbrook	3.09	2.59	3.87
16	Swift	3.15	2.87	2.44
17	Tennant	6.66	1.53	3.10
18	Wedgetail	2.62	2.50	2.46
19	Wyalkatcham	2.49	1.40	1.80
20	Wylah	4.18	2.69	3.39
Average		**3.90**	**2.94**	**3.36**
LSD 5%		**3.45**	**1.26**	**2.10**

Table 7-5 indicates that the lowest screenings were achieved with the May sowing date.

Table 7-6 Impact of Sowing Time on Grain Protein

Variety	Name	April	May	July
1	Batavia	14.20	12.35	11.35
2	Carnamah	11.45	11.65	10.20
3	Chara	11.00	11.45	11.65
4	Gregory	12.25	11.20	10.40
5	Frame	12.70	11.45	11.15
6	Glover	13.45	11.70	10.65
7	Kellalac	11.95	11.25	10.10
8	LH71	10.35	9.65	11.40
9	MacKellar	10.30	9.35	9.95
10	Marombi	10.70	11.45	10.15
11	Matong	11.45	11.20	11.40
12	Oxley	10.90	11.30	11.75
13	Pastor	11.85	11.45	11.30
14	Silverstar	13.40	11.00	10.90
15	Sunbrook	11.10	11.35	11.80
16	Swift	11.85	11.75	11.45
17	Tennant	10.20	10.60	9.40
18	Wedgetail	11.60	11.30	12.10
19	Wyalkatcham	13.40	12.50	11.70
20	Wylah	11.25	11.05	11.45
Average		11.77	11.25	11.01

Table 7-6 shows a decline in grain protein as sowing date was delayed.

Figure 7-1: Grain Yield Response To Sowing Time

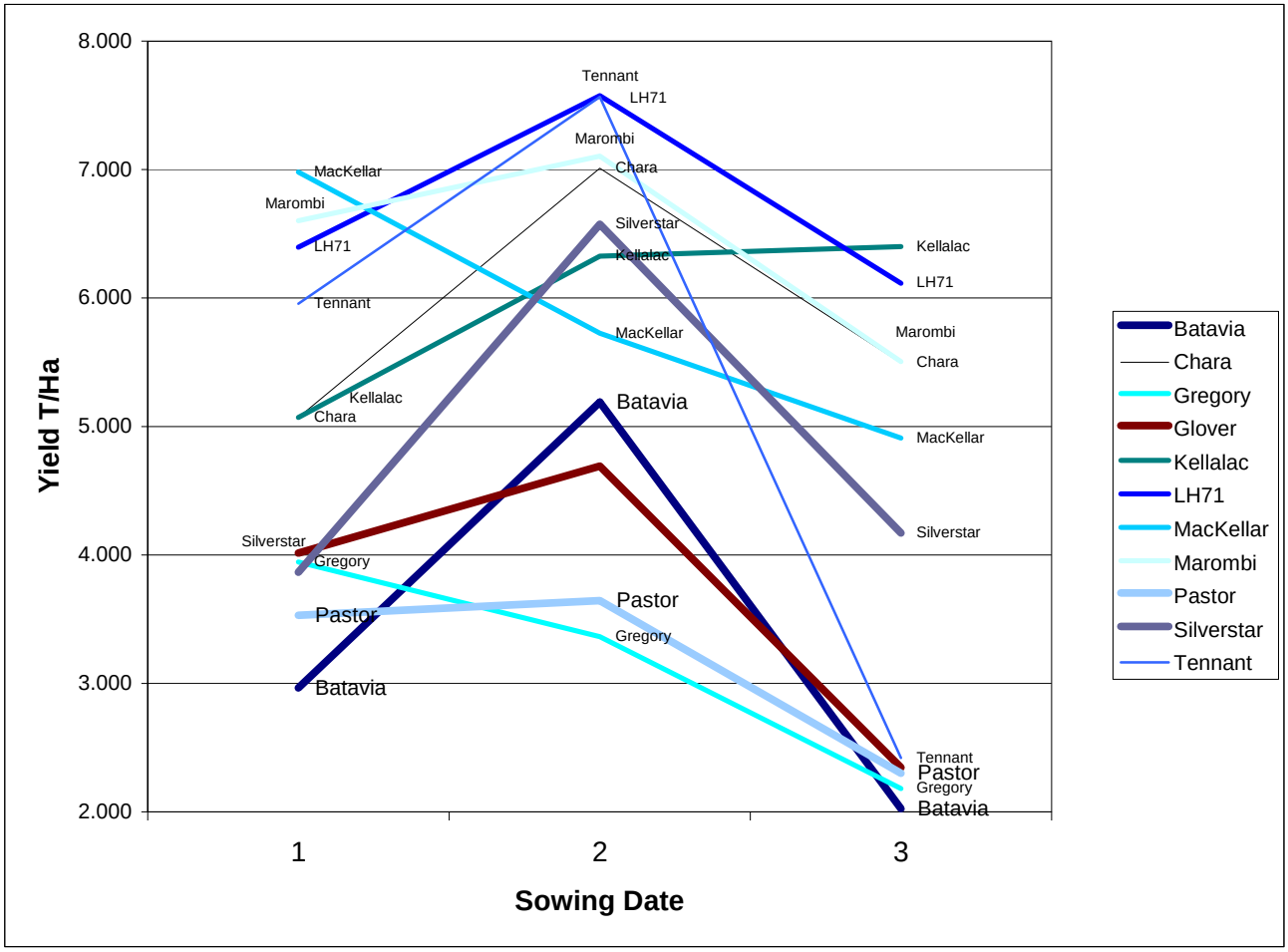

Figure 7-1 clearly shows the effect of sowing time on grain yield for a number of varieties. If we look at the worst performing lines (Pastor, Glover, Gregory and Batavia) and the best performing lines (Chara, Kellalac, LH71 and Marombi) and examine their respective growth patterns, an interesting result is shown in Table 7-7.

Table 7-7: Time (Number Of Days) Spent In Each Growth Period

	[20]GS11 – GS30			[21]GS30 – GS61			[22]GS61 – GS90		
	Apr	**May**	**Jul**	**April**	**May**	**July**	**April**	**May**	**July**
Average Good Varieties	65	75	76	63	40	23	58	37	33
Average Poor Varieties	49	63	64	74	47	35	63	56	43

[20] period between crop emergence and end of tillering
[21] period between end of tillering and commencement of flowering
[22] period between commencement of flowering and grain physiological maturity

As can be seen, the highest yielding varieties spent more time in GS11 – GS30, and less time in the other 2 growth stages compared to the low yielding varieties. Hence it would appear that we need to be selecting varieties that have a long vegetative phase but relatively short in the construction and grain fill phases in order to maximize grain yield and quality. This however needs to be clarified with further research.