

# The effect of sowing time on the yield and quality of canola (*Brassica napus*) – preliminary findings

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## ABSTRACT

The effects of sowing time on the yield and oil concentration of canola (*Brassica napus*) were investigated at Cowra in the central west of NSW in one trial in each of 2 years, 2007 and 2008. Eighteen canola varieties of differing maturities, one juncea canola and one condiment mustard were established at three sowing times from early-May to mid-June.

Both variety and sowing time had significant effects on flowering duration. There was also a significant interaction between sowing time and variety on yield. Yield declined with each delay in sowing time. Grain oil concentrations were reduced in one trial and not in the other. The trial will be sown again in 2009.

**Key words:** canola – sowing time – variety specific – flowering – grain yield – grain quality

## INTRODUCTION

The central west of NSW has traditionally been a major producer of canola. The usual canola sowing window is from Anzac Day (25<sup>th</sup> April) until the end of the 2<sup>nd</sup> week in May. Advice to farmers is to sow early to allow seed filling before the high temperatures and evaporation rates of late spring. However, over the last five years, late and unreliable seasonal breaks have tempted farmers to push the sowing window into the end of May and even into June.

A number of studies have shown yield decline in canola with delay in sowing (Hocking and Stapper 2001; Hodgson 1979; Mendham et al. 1981; Thurling 1974). Reported rates of yield decline per week attributed to delayed sowing have ranged from 7% to 11% (Richards and Thurling 1978); +4 to -10% (Robertson et al. 1999) and 3.2% to 8.6% (Farr et al. 2002).

In addition, canola oil content has been found to decline with later sowing (Hocking and Stapper 2001). Hocking and Stapper (2001) concluded that oil concentration reduced by 3% per month sowing delay. They concluded the reduction was due to increased temperature and water stress during grain filling.

Few studies however have looked at the response of individual varieties. A pilot project was funded by the Grains Research and Development Corporation to provide variety specific information to augment the National Variety Testing (NVT) trial system.

Field trials were established at the Cowra Agricultural Research and Advisory Station. The impact of sowing time on flowering time, flowering duration, yield and oil quality was studied.

This paper reports the preliminary results from the 2007 and 2008 seasons. The trial work is on-going.

## MATERIALS AND METHODS

Field trials were conducted at the Cowra Agricultural Research and Advisory Station in Central NSW in 2007 and 2008. The trials were sown into cereal stubble. The soil type is a red-brown earth.

Eighteen canola, one juncea canola and one condiment mustard variety were sown at 3 different sowing times (ST). Varieties tested were commercial spring types including conventional, hybrid, triazine tolerant and imi-tolerant types. Some of the varieties included were different in each year, reflecting the rapid change in commercial varieties. There were 12 varieties common to both years of trials.

The 3 sowing times were spaced approximately 2 weeks apart, beginning with the first rainfall event after the 25<sup>th</sup> of April (Table 1).

Varieties were sown at a seeding rate of 3 kg/ha into 7.5 x 2 m plots at 25 cm row spacing. The plant population of 4 varieties was counted to determine base plant population. The whole trial was scored for establishment. The start and end of flowering was recorded year day. The start of flowering was taken as when 20% of plants had an open flower. The end of flowering was recorded when 20% of plants still had an open flower. Plots were harvested with a plot harvester and a sub-sample was tested for quality using NIR.

Experimental design was a 3 replicate, randomised split plot design with sowing date as the main plots. Data was analysed with using either analysis of variance or ASREML. ASREML was used when spatial adjustment resulted in lower standard errors.

Table 1: Sowing dates of and growing season rainfall.

	Sowing date		Growing season rainfall	
	2007	2008	2007	2008
Sowing time 1	8th May	2nd May	216 mm	303 mm
Sowing time 2	29th May	16th May	216 mm	309 mm
Sowing time 3	12th June	30th May	185 mm	320 mm

\* Growing season rainfall = fallow storage from March to the sowing date + in-crop rainfall.

## RESULTS AND DISCUSSION

Growing season rainfall in 2007 was below the long term average of 306 mm (Table 1). This resulted in low yields and drought stress, particularly in the later sowing time treatments.

### Effect of sowing time on flowering

In both years there was a significant interaction between sowing time (ST) and variety (Table 2). In neither year was this difference related to the nominated variety maturity class.

Flowering duration decreased with later sowing in both years (Table 2). The reason for the much longer duration (18 days) between ST 1 in 2008 compared to ST 1 2007 is not known. Flowering duration difference of ST 2 differed by 6 days and ST 3 flower durations were equal between years. It seems likely that the drier conditions of 2007 reduced flowering duration in 2007 and that these effects were masked by later sowing.

Table 2. Sowing time effects on canola yield, flowering time and grain quality.

Variable	Year	Sowing time			Probability
		1	2	3	
Start of flowering (year day)	2007	239	246	253	0.001
	2008	219	240	253	0.001
Flowering duration (days)	2007	34	31	28	0.05
	2008	52	37	27	0.001
Grain yield (kg/ha)	2007	1721	1121	617	0.001
	2008	2185	2980	2601	0.001
Glucosinilates (µmoles per gram of meal)	2007	12	15	17	0.001
	2008	18	17	18	ns
Meal Protein (%)	2007	47.2	46.9	46.3	0.001
	2008	45.0	44.6	46.0	
Grain oil concentration (%)	2007	39.61	39.88	38.91	ns
	2008	42.40	42.40	40.80	

The differences between the fastest and slowest varieties in time to the start of flowering was also larger in ST 1 compared to ST 2 and ST 3 (data not presented), suggesting that drought and high temperatures reduced the time to flowering. The end of flowering was more uniform and coincided with an increase in temperatures at the start of October.

### Effect of sowing time on yield

Response to later sowing was different in 2007 compared to 2008. In 2007 yield declined by an average of 200 kg/ha per week delay in sowing over the 3 sowing times (Table 3). The rates of yield decline in this trial were much higher rates of yield decline that reported in the literature. In 2008 the first time of sowing was lower yielding than both the later sowing times (Table 1). It is hypothesised that this sowing time used all the soil moisture before grain filling began in the very dry spring.

There was a significant interaction between sowing time and variety in both years (Table 3). An example of this is the variety AV\_Garnet which showed a large response in 2008. It was the highest yielding in ST 1 and ST 3 but was 8<sup>th</sup> highest in ST 2. Hyola 50 moved from 8<sup>th</sup> ranking in ST 1 to 1<sup>st</sup> in ST 3.

Table 3. Grain yield of canola varieties sown at 3 sowing times at Cowra in 2007 and 2008.

Variety	2007				2008			
	Sowing Time				Sowing Time			
	1	2	3	Mean	1	2	3	Mean
	8 May	29 May	12 Jun		2 May	16 May	30 May	
44C73	1700	1113	761	1192				
44C79					1711	2602	2634	2316
45Y77	1880	1141	740	1254	2182	3069	2913	2721
46C76	1537	1089	491	1039				
46Y78					2103	3006	2822	2644
AG_Muster	1857	1194	586	1212				
AG_Spectrum	1770	1184	548	1167	2220	3080	2509	2603
ATR_Banjo	1259	799	434	831				
ATR_Cobbler					2522	2954	2493	2656
ATR_Marlin					2177	2837	2541	2518
ATR_Summitt	1454	731	306	830				
AV_Garnet	2095	1576	725	1465	2997	3714	2684	3132
AV_Jade	1720	1164	738	1207	2011	3005	2564	2527
AV_Opal	1819	1234	529	1192				
Bravo_TT	1447	924	401	924	2331	2937	2683	2650
CBWA_Tanami	1870	1106	522	1166	2248	2666	2454	2456
Hyola_50	2591	1403	1067	1687	2218	3435	3466	3039
Hyola_75	2460	1641	1121	1741				
Hyola_76					1810	3185	2915	2637
Oasis_CL							1203	
Selection_2	1895	1112	804	1270	2797	3339	2711	2949
Skipton	1429	857	546	944	1779	2794	2613	2395
Tarcoola	1361	1203	792	1199	2452	3192	3002	2885
Tawriffic_TT					1823	2787	2453	2354
Thunder_TT	1467	741	511	906	1909	2406	1897	2070
Tornado_TT	1464	1162	358	994				
Warrior_CL	1353	1051	358	920				
Mean	1721	1121	617	1153	2185	2980	2601	2589
lsd								
Sow time	206	***			192	***		
Variety	197	***			286	***		
Sow time x Variety	350	***			508	***		

### Effect of sowing time on quality

In 2007, there was a significant difference between varieties in grain oil content but no significant interaction between sowing time and variety in grain oil content.

In 2008, there were significant effects of variety, sowing time and a significant interaction between variety and sowing time. ST 1 and ST 2 had similar grain oil concentrations with ST 3 having lower grain oil concentration.

The responses of some the varieties grain oil concentration was different to their response to grain yield. For example AV\_Garnet had a large interaction of grain yield and sowing time but was relatively stable in response of grain oil concentration with a shift in rank of 7 to 3 (Table 4).

Table 4. Effect of sowing time and variety on grain oil of canola at Cowra in 2007 and 2008.

Variety	Grain oil content (%)				
	2007 Mean	2008			Mean
		Sowing time 1	Sowing time 2	Sowing time 3	
44C73	39.6				
44C79		44.0	43.6	41.53	43.1
45Y77	39.9	40.23	41.23	39.48	40.2
46C76	38.7				
46Y78		41.4	41.27	40.1	40.9
AG_Muster	38.4				
AG_Spectrum	38.6	41.0	42.43	39.33	41.0
ATR_Banjo	40.0				
ATR_Cobbler		41.87	43.0	39.03	41.4
ATR_Marlin		43.57	42.6	40.77	42.4
ATR_Summitt	39.1				
AV_Garnet	39.9	43.13	43.73	42	43.0
AV_Jade	40.5	43.17	42.77	40.8	42.3
AV_Opal	41.1				
Bravo_TT	38.2	41.1	41.3	39.4	40.7
CBWA_Tanami	37.9	39.93	41.83	39.9	40.6
Hyola_50	40.9	41.8	42.33	41.53	41.9
Hyola_75	38.5				
Hyola_76		42.13	44.0	40.83	42.4
Selection_2	37.5	41.93	40.63	38.63	40.44
Skipton	40.4	43.63	43.9	41.7	44.3.1
Tarcoola	41.9	44.07	45.77	43.6	44.5
Tawriffic_TT		42.77	43.77	41.6	42.7
Thunder_TT	38.6	41.73	41.0	38.8	40.6
Tornado_TT	40.2				
Warrior_CL	39.5				
Mean	39.5	42.2	42.7	40.5	41.8
Lsd					
Sow time	ns	0.5			
Variety	0.7	1.0			
Sow time x Variety	ns	2.3			

### CONCLUSION

Choosing a variety requires an understanding of its maturity. In unreliable seasons it also requires an understanding of its response to later sowing. The different pattern of response of some varieties to grain yield and grain oil concentration is interesting and suggests that a better understanding of the responses will assist in variety choice decisions. The trials will be sown again in 2009.

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