

Understanding canola variety development to improve yields

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Key findings

- The 2015 season was cooler than 2014 which affected how canola varieties developed and grain yields.
- Early sowing presents a good opportunity to improve canola water use efficiency and yields but variety selection is important.

Why do the trial?

The 2015 season formed the second year of field trials conducted at a number of locations across South Australia, investigating options to increase canola profitability and reduce production risk with tactical agronomy advice underpinned by physiological insights. In this project SARDI is working in conjunction with CSIRO and NSW DPI to undertake physiological and agronomic research from southern QLD to the Eyre Peninsula.

Research conducted by John Kirkegaard and Mike Robertson, CSIRO, that concluded in 2005 found water use efficiency in canola was typically maximised through early sowing. However, this research was conducted prior to the release of many of the modern hybrid varieties available today. The research also didn't explore the effect of canola yield and development when sowing time is pushed into even earlier sowing windows that are now possible with modern farming practices.

In both 2014 and 2015 trial sites were established at three sites in South Australia (Yeelanna, LEP, Hart, Mid North and Lameroo, Mallee). In each year a range of high yielding canola varieties were planted at multiple sowing times, starting from mid-April. A range of development stages were recorded throughout the season as well as grain yield. The results aim to improve the water use efficiency of canola, through early sowing and correct variety selection. It will also provide researchers with information on how canola develops in different environments so that further improvements to yield can be exploited.

How was it done?

Plot size	2.0 m x 10.0 m	Fertiliser	100 kg/ha DAP (18:20) @ sowing + 150 kg/ha N post emergent
Seeding dates	14 th April 2015 30 th April 2015 15 th May 2015		

The trial was randomised block design (with times of sowing blocked together) and measurements included: pre-sowing nitrogen, soil moisture, flowering dates, hand harvested yields, grain oil.

Results and discussion

Comparisons between 2014 and 2015

Similar trials have been conducted on the Hart field site in 2014 and 2015, where sowing dates were within a day of each other in each year and the majority of the varieties were the same. This allows for comparisons between seasons and provides some insights into the drivers of development in several of the varieties.

Figure 1 shows the cumulative average daily temperature for Snowtown from 15 April (selected as it has longer term data). The cumulative daily temperature is the daily maximum temperature plus the daily minimum temperature divided by two, with each temperature from 15 April added together to provide a cumulative total. This shows that the temperatures observed in 2014 were considerably warmer than the average figure and in 2015 temperatures were slightly cooler than average.

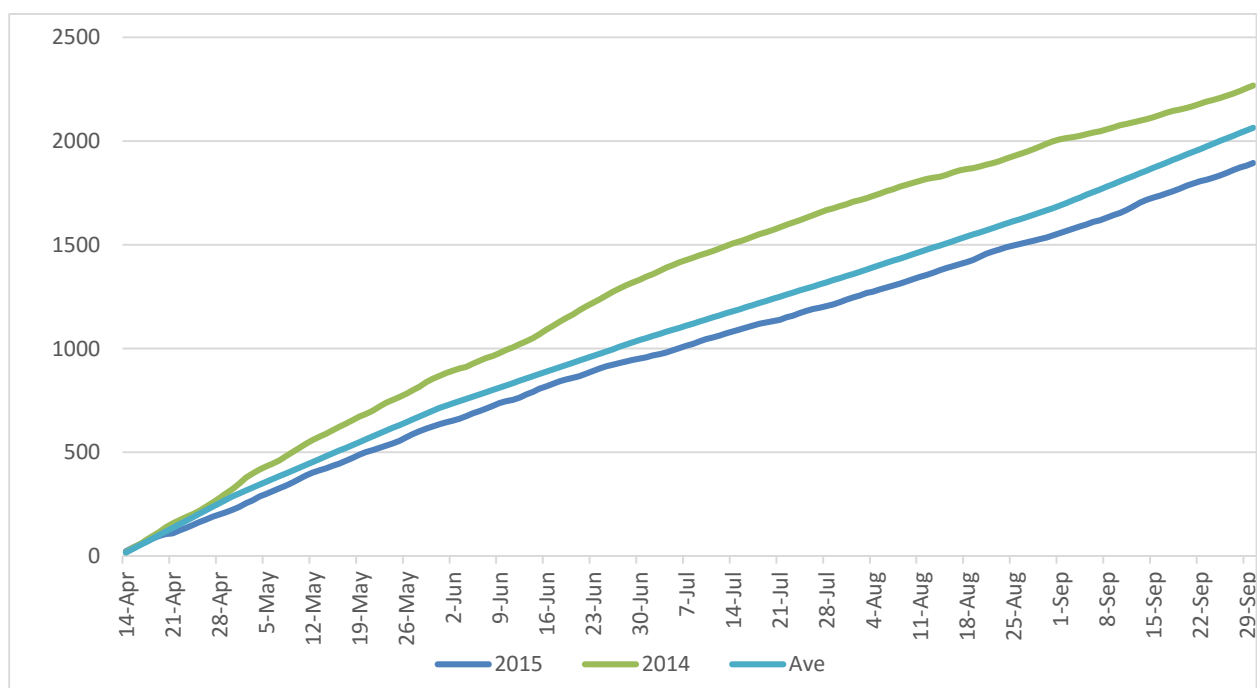


Figure 1. Cumulative average daily temperature for Snowtown (long term average, 2014 and 2015)

The effect of temperature on flowering date and subsequently yield for two varieties in 2014 and 2015 is shown in Table 1. Both varieties, Hyola 575CL and Pioneer 45Y88CL flowered two weeks earlier in ToS 1 (mid-April) in the warmer conditions of 2014 compared with 2015. However, Pioneer 45Y88CL flowered over two weeks later than Hyola 575CL in the first time of sowing 2014. The grain yield of Hyola 575CL from ToS 1 compared to ToS 2 (1 May) in 2014 showed a 0.57 t/ha yield advantage from delaying sowing by two weeks in this variety, but no advantage from either sowing date with Pioneer 45Y88CL. This indicates that thermal time (or cumulative temperature) is a factor in the development of both varieties, but plays a more important role in Hyola 575CL, as when planted early (mid-April), can race through its development and flower too early resulting in a yield penalty. This effect was stronger in warmer 2014 than 2015, but is still a risk if deciding to plant early. The 50% flowering date for all varieties and ToS trialed in 2015 are presented in Table 2.

Table 1. 50% flowering dates and yield of two selected canola varieties at Hart, 2014 and 2015.

Hart		ToS1		ToS2		ToS3	
		2014	2015	2014	2015	2014	2015
Flowering Date	Hyola 575	29-Jun	16-Jul	2-Aug	10-Aug	31-Aug	25-Aug
	45Y88CL	16-Jul	4-Aug	17-Aug	17-Aug	4-Sep	31-Aug
Yield (t/ha)	Hyola 575	1.49	2.31	2.06	2.4	2.05	1.75
	45Y88CL	1.98	2.54	1.96	2.16	1.89	1.76

2015 Yield and Flowering Date

Hand harvest yields are presented (Figure 2) as birds caused significant damage to some plots that made plot harvested yields unrepresentative. This may have inflated the grain yields, but relative differences should be consistent. The variety 44Y89CL in time of sowing 1 had too much bird damage for yields to be displayed here.

Grain yields show that in 2015 most varieties benefited from planting in mid-April, with these treatments having the highest yields. The exception to this was the early maturing variety ATR Stingray and Hyola 575CL.

Table 2. 50% flowering dates of nine varieties sown at different sowing dates at Hart in 2015.

	14-Apr	30-Apr	15-May
44Y89CL	23-Jul	10-Aug	25-Aug
45Y88CL	4-Aug	17-Aug	31-Aug
Archer	10-Aug	20-Aug	4-Sep
ATR_Gem	18-Jul	14-Aug	28-Aug
ATR_Stingray	7-Jul	4-Aug	20-Aug
AV_Garnet	31-Jul	14-Aug	28-Aug
Hyola_559TT	20-Jul	10-Aug	25-Aug
Hyola_575CL	16-Jul	10-Aug	25-Aug
Hyola_750TT	4-Aug	17-Aug	31-Aug



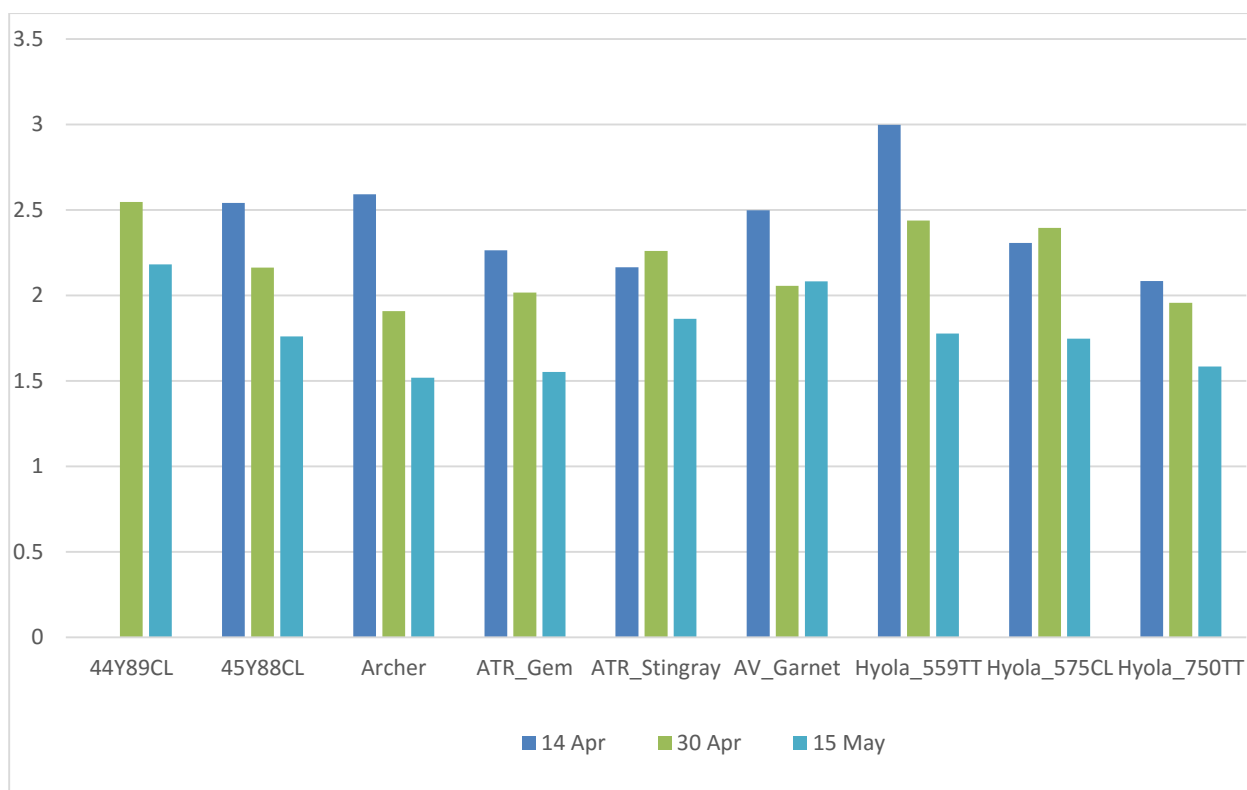


Figure 2: Hand harvest grain yields (t/ha) from Hart, 2015 (lsd $P=0.05\%$: 0.31t/ha).

Summary / implications

Two years of field trial data at the Hart field site has shown early sowing can offer an opportunity to maximise canola yields and water use efficiency. Sowing early may also offer other benefits to the farming system by taking the pressure off of the peak sowing window for wheat. Selection of the correct variety is important for this to be realised. Varieties that have their development largely affected by cumulative temperature such as ATR Stingray and Hyola 575CL may not be suitable for planting in mid-April in the Hart environment. Early sowing of canola must take into consideration the risk of pests and diseases that it may have and these should be carefully managed.

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