Performance of canola types suited to the HRZ

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Key messages

- New late maturing non-commercial lines were amongst the highest yielding, with yields greater than 6 t/ha
- The winter-spring crosses K50055 and K50058 and winter types AGF437 and AGF484 have performed consistently well across a number of seasons at Hamilton and Inverleigh
- Optimising sowing times may provide additional yield increases
- High yields were achieved from poor plant establishment numbers, showing that canola has the ability to compensate from low plant numbers if the seasonal conditions are favourable

Key words: canola, early, mid, late maturity, winter and spring types

BACKGROUND

Winter canola types have shown a yield advantage over the spring types across a number of seasons in the High Rainfall Zone (HRZ) of Victoria and Tasmania (Vague et al 2016, Riffkin et al 2012). Experimental yields have been as high as 8 t/ha with some growers reporting yields of 6 t/ha in commercial crops. Winter types can be around 4 weeks later to flower and harvest than the commercial spring types. Spatial modelling studies indicate that they are best suited to the cooler coastal areas where rainfall is higher and spring temperatures cooler (Figure 1 and Christy et al 2013). Over the past couple of years winter x spring lines have been included in evaluation trials. The maturity of these lines is about 2 weeks later than the spring types and as such may be suited to a wider area, including the more marginal areas of the HRZ where soil water holding capacity is poor and spring rainfall less reliable. At present these lines are not commercially available. A canola variety experiment was conducted at the SFS Inverleigh trial site in 2017 to help assess the potential of non-commercial later maturing lines for the HRZ of southern Australia. Due to large differences in maturity of the lines tested it is not possible for these lines to be included in the current NVT program.

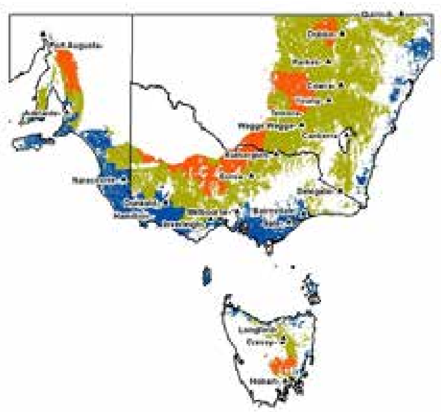

Figure 1. Map showing areas where winter types are likely to yield 5% or more (blue), no differently (green) or 5% less (red) than the commercial spring types (e.g. Hyola50). Predictions are based on 50 years of historical climate data, soil type and the optimum sowing time for each maturity type.

METHOD

A total of 18 canola lines were sown in 4 replicates (72 plots) at the Inverleigh SFS trial site on 7 May 2017. The lines included a wide range of maturity types from early spring to late winter types, with 14 from the Clearfield herbicide tolerance group and 4 Conventional. Thirteen lines not commercially available to growers and 5 commercial controls; Edimax, Hyola970, Carbine, 45Y91 and Victory 7001Cl were included in the evaluation for yield and quality (Table 1). The trial was sown using the SFS cone seeder on 178 mm row spacings with knifepoint tynes and press wheels. Plot size was 10 m in length and 1.43 m wide with 8 rows. Plants were sown based on seed size and germination tests for a target plant density of 50 plants/m2. The trial was sown with 100 kg MAP, with a further 160 kgN/ha applied in-crop as urea in two applications on July 26 (200kg urea/ha) and 15 August (150 kg urea/ha). Pre-sowing (May 6), Rustler (1L/ha), Hammer (45 ml/ha) and Weedmaster Argo (1.6L/ha) were applied to the site. Post sowing, pre-emergent treatments included Dual Gold (250 ml/ha), Pyrinex Super (1L/ha) and Metarex (5kg/ha). In-crop herbicides included Liaise (1l/ha), Intervix (750 ml/ha to Clearfield varieties only), Select 240 (500 ml/ha) and Hasten (1L/ha) applied on 30 June. Prosaro was applied on 12 July (450 ml/ha). The previous crop (2016) was hay oats.

Plant numbers were counted from 10 representative positions within each plot 6 weeks after sowing. Dates of bud visible, first flower and final harvest were recorded. At final harvest, lines were hand harvested individually according to maturity when seed colour was between 40 and 60% brown/black by cutting two by one m2 cuts per plot. Hand cuts were taken from areas in the plot where numbers were the most consistent, with plants present in each of the six rows cut. Three plots from separate lines were not harvested due to insufficient plant numbers. Samples were oven dried at 40°C then threshed to separate grain and stubble.

Data for the different herbicide groups were analysed separately by REML using Genstat 17 Edition. Due to poor plant establishment, plant numbers at establishment and final harvest were used as covariates in the initial analyses to determine if plant numbers influenced final yields. Plant numbers had no significant effect on yield and therefore results have been presented for grain yield alone.

Table 1. Canola lines sown at Inverleigh SFS trial site in 2017

Line	Seed Source	Herbicide Group	Maturity	Commercially available in 2017
45Y91	Pioneer	Clearfield	Mid Spring	Yes
AGF437	AGF	Clearfield	Late winter	No
AGF484	AGF	Clearfield	Late winter	No
AGF524	AGF	Clearfield	Late winter	No
AN16R2017	Bayer Crop Science	Conventional	Mid Spring	No
AN16R2024	Bayer Crop Science	Conventional	Mid Spring	No
AN16R2031	Bayer Crop Science	Conventional	Mid Spring	No
Carbine	Heritage Seeds	Clearfield	Early-Mid Spring	Yes
Edimax	AGF	Clearfield	Late winter	Yes
Hyola577CL	Advanta Seeds	Clearfield	Mid Spring	Superseded
Hyola635CC	Advanta Seeds	Conventional	Mid-Late Spring	Superseded
Hyola970CL	Advanta Seeds	Clearfield	Late winter	Yes
K50054	Advanta Seeds	Clearfield	Winter x Spring	No
K50055	Advanta Seeds	Clearfield	Winter x Spring	No
K50056	Advanta Seeds	Clearfield	Winter x Spring	No
K50057	Advanta Seeds	Clearfield	Winter x Spring	No
K50058	Advanta Seeds	Clearfield	Winter x Spring	No
Victory7001CL	Cargill	Clearfield	Mid Spring	Yes

RESULTS

Plant Numbers

Establishment was poor, averaging only 14.5 plants per m2 (7.3 – 33.8) due to heavy rains immediately after sowing. There was no significant difference in plant establishment between the varieties. At final harvest, overall average plant numbers were 22.5 plants per m2 (12.6 – 33.4). Analyses showed that the differences in plant numbers at either establishment or final harvest did not significantly influence the grain yields (Figure 2).

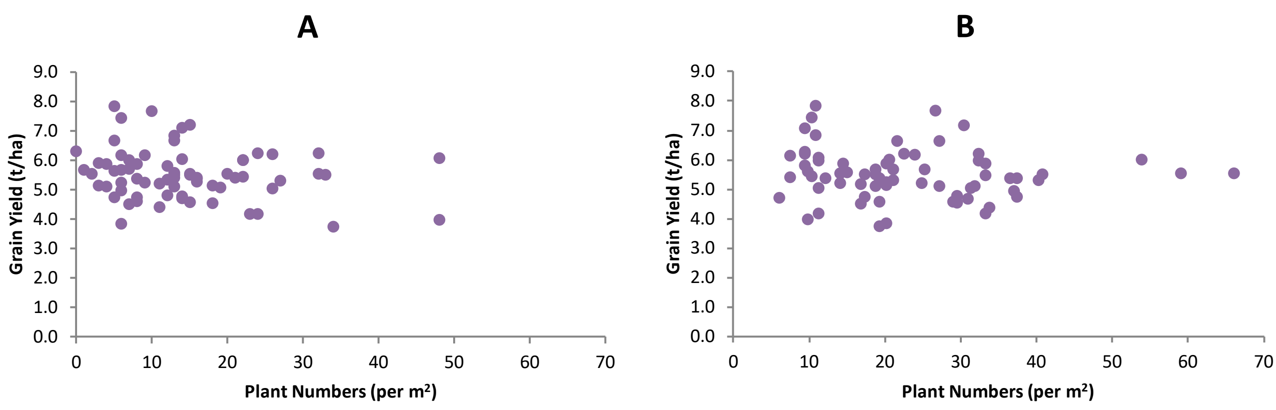

Figure 2. Relationship between grain yield and plant establishment numbers six weeks after sowing (A) and plant numbers at harvest (B). Counts at establishment were determined from the whole plot whereas numbers at final harvest were taken from areas where plants were present in each of the cut rows. Some germination occurred after the establishment counts were taken.

Phenology

Lines displayed a wide range in phenology. Bud development was delayed by up to 47 days, flowering by 19 and final harvest by 28 days in the winter types compared to the earliest maturing spring types (Figure 3).

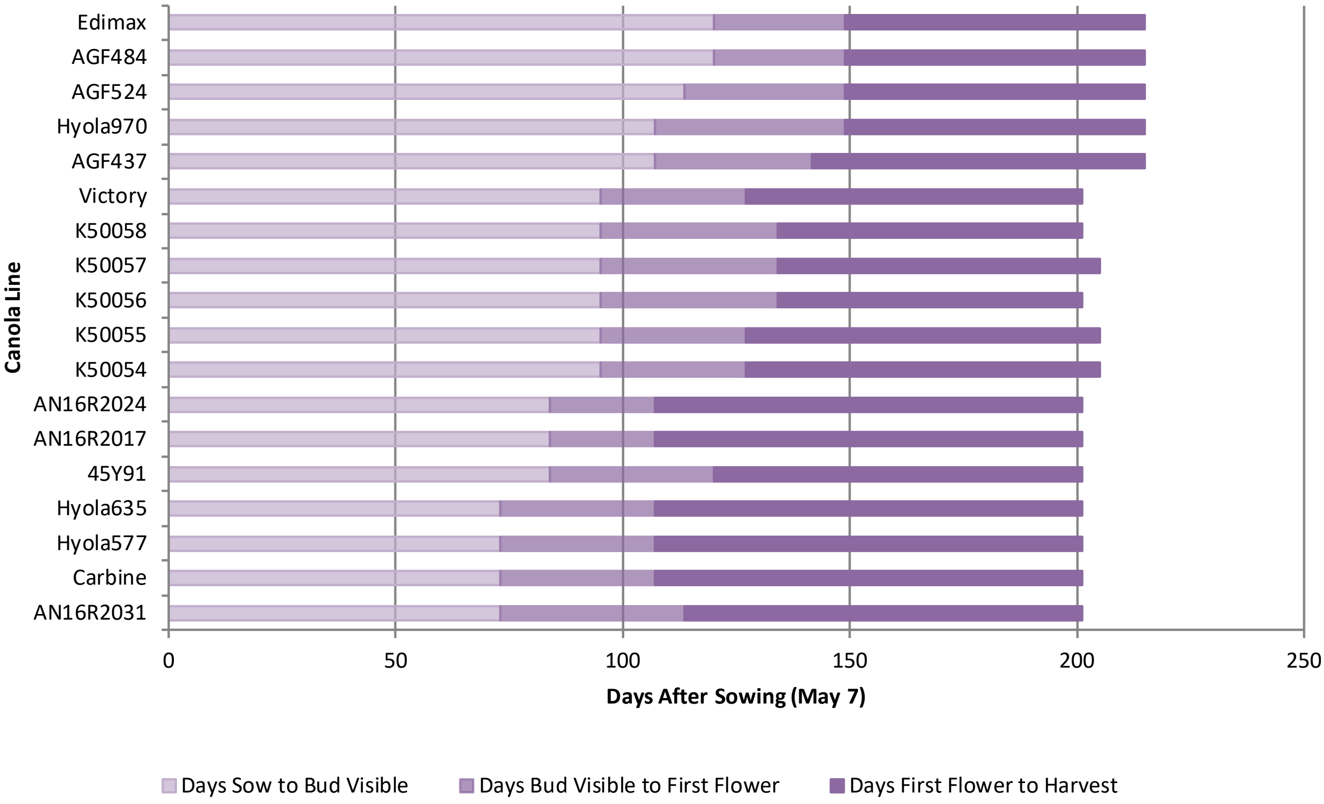

Figure 3. Phenology of the 18 lines sown at Inverleigh in 2017. Sowing date was 7 May.

Grain yields

Mean grain yields for both the Clearfield and Conventional trials were 5.5 t/ha, ranging from 4.2 t/ha to 6.6 t/ha for the Clearfields and 4.9 t/ha to 5.7 t/ha for the Conventional lines. The highest grain yield of the Clearfield lines was from K50055, which yielded significantly more than six of the bottom yielding lines. There was no significant difference in yield among the Conventional lines (Figure 4). There was no overall relationship between grain yield and crop maturity. However, the four highest yielding lines were late maturing winter-spring crosses (K50055 and K50058) or winter types (Edimax and AGF437).

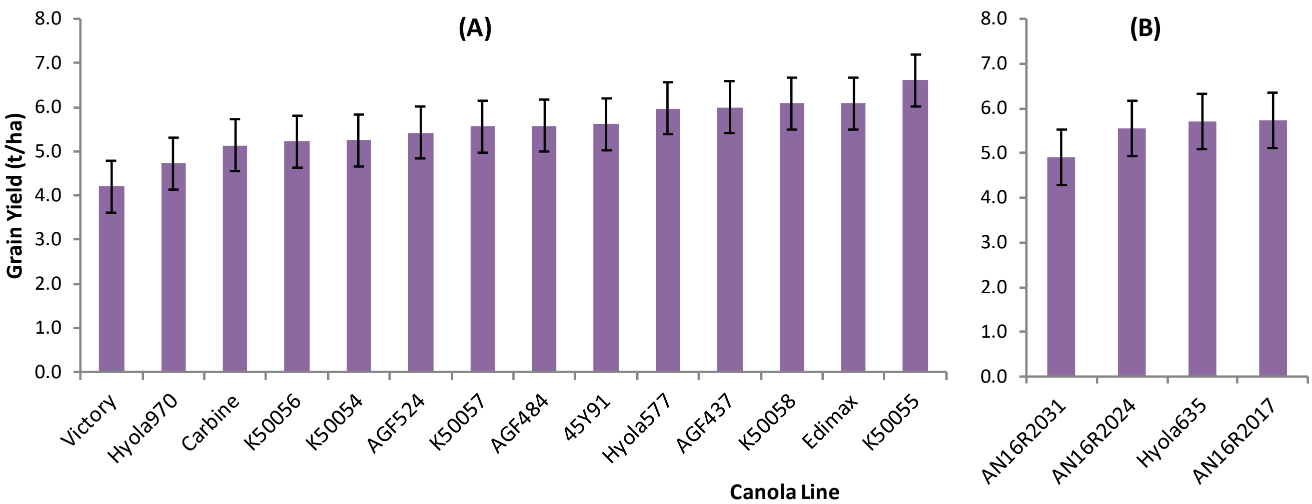

Figure 4. Grain yields of the 18 lines sown at Inverleigh in 2017. The Clearfield (A) and Conventional (B) lines were analysed separately. Error bars show ±SE.

DISCUSSION

Although plant establishment was poor due to very heavy rains immediately post sowing, favourable conditions throughout the remaining season, especially in spring, meant that plants in plots with very low numbers had time to compensate and produce multiple branches and pods so that grain yields were not severely compromised. There was no significant difference in establishment between the varieties, indicating that no variety was better able to cope with the flooding conditions at sowing. In contrast to plant establishment where plant numbers were determined across the whole plot, at final harvest, hand cuts were only taken from areas where there were reasonable plant numbers and bare areas were avoided. Due to the different methods for counting plants, plant numbers at establishment and final harvest are not comparable so it is not possible to determine if some varieties were more able to compensate for the poor establishment (e.g. through delayed germination).

A number of the non-commercial lines performed well, including the winter-spring crosses K50055, K50058 and the winter types AGF437 and AGF484. These lines have yielded consistently well over a number of seasons at both Hamilton and Inverleigh (Table 2).

Table 2. Yield as a percent of the site means from evaluation trials at Hamilton (Ham) and Inverleigh (Inv) from 2015 to 2017. Not all lines sown in each trial have been included in the table.

Line	2015Ham	2016Ham	2016Inv	2017Inv	Mean
45Y91		1.02	0.96	1.01	1.00
AGF437	1.00	1.08	1.21	1.08	1.09
AGF484		1.20	1.09	1.01	1.10
AGF524				0.98	0.98
AN16R2024		1.02	1.01	1.01	1.02
AN16R2017				1.05	1.05
AN16R2031				0.90	0.90
Carbine				0.93	0.93
Edimax	1.11	1.15	0.97	1.10	1.08
Hyola 577CL	0.99	0.93	0.89	1.08	0.97
Hyola 635CC	1.08	1.02	1.09	1.04	1.06
Hyola 970CL	0.98	1.02	1.06	0.85	0.98
K50054	0.95	1.02	1.05	0.95	0.99
K50055	1.14	1.11	1.06	1.19	1.13
K50056	1.21	1.13	0.96	0.94	1.06
K50057	1.11	1.14	0.98	1.00	1.06
K50058	1.18	1.11	1.01	1.10	1.10
Victory V7001CL	1.03	0.77	0.92	0.76	0.87

The lack of a relationship between grain yield and crop maturity may have been due to all crops being sown on the same date (May 7). Differences in yield may be greater if each of the lines were sown on its optimum sowing date.

CONCLUSION

Despite poor establishment, plants were able to compensate in the good season to produce high yields. A number of non-commercial, late maturing lines performed well, consistent with results from previous years and other locations. Differences in yields may have been greater if each of the lines had been sown at their optimum sowing time. Identifying the optimum sowing time will be important to maximise yields if these lines, particularly those with new maturities become commercially available to growers.

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