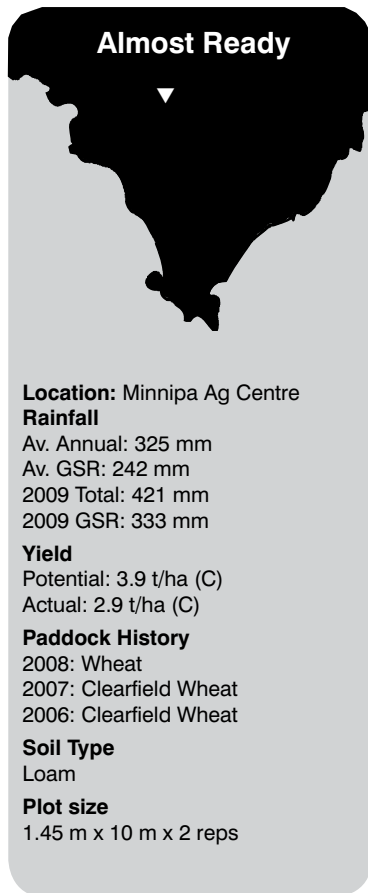


Selection of Canola Lines for Low Rainfall Environments in South Eastern Australia

RESEARCH

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Why do the trial?

The development of a profitable break crop in low rainfall cereal growing areas is essential for sustainable and profitable systems. Until now canola, peas and lupins have been the most promising options, with canola having several valuable characteristics (eg herbicide tolerance and high value grain). It is relatively free of disease in low rainfall areas and is able to utilise the high nitrogen levels following medics and leguminous crops which makes it ideally suited to low rainfall rotations.

With the decision by GRDC to withdraw from mainstream canola breeding, selection and evaluation, this role has been taken over by the four major commercial companies, namely Nuseed, Pioneer, Pacific Seeds and Canola Breeders Western Australia Pty Ltd.

There have been concerns that the commercial breeding companies may not select and evaluate new lines in low rainfall areas because of geography, cost, small size of the potential market and risk of losing material in poor seasons. This was confirmed in discussion with the breeders, although CBWA are committed to breeding for low rainfall areas.

Following discussion with the companies, GRDC agreed to support a program for early lines from the various canola breeding programs to be selected in trials in the districts located around Minnipa (SA), Walpeup (Vic), and Condobolin (NSW).

How was it done?

In 2009, about 120 lines were trialled at Minnipa and Condobolin. These included TT, Round up Ready (except in SA because of the GM Moratorium) and conventional lines. There were no trials in the Victorian Mallee because Vic DPI did not have its protocols in place.

The various lines were assessed for early vigour, height, lodging, time to mid-flowering and yield. Other characteristics which may be of commercial significance (eg sensitivity to herbicides) were also noted.

The trial at Minnipa was sown on 1 May with 19:13:0:0 @ 70 kg/ha and urea @ 50 kg/ha. The pre-sowing knock down used was 1.2 L/ha of Triflur-X and 1 L/ha Sprayseed, and 750 ml/ha Lorsban was also applied one week after sowing to prevent insect damage especially cut worm and Red-legged earth mite.

Grasses and insects were controlled 6 July with 250 ml/ha Select, 500ml/ha Astound, 1 L/100L Hasten and 100 ml/100L Chemwet 1000.

Plots were scored for emergence in May and for flowering time at the end of July, and harvested on 26 October. Grain analysis included commercial tests such as oil content and protein.

What happened?

At Minnipa a total of 64 advanced lines, with 35 conventional and 29 Triazine lines, were sown with current commercial lines as check varieties. At Minnipa, it was one of the best seasons ever, with 333 mm rainfall in the growing season.

Key messages

- **The first year of trials show that there is material with real potential to do well in low rainfall environments and develop lines which will be economic as break crops in future.**
- **In 2009, about 120 lines were trialled at Minnipa and Condobolin.**
- **At Minnipa with an exceptional season yields ranged from 1.7 to 2.9 t/ha, with an average over 2.4 t/ha.**
- **At Condobolin, under tough conditions, individual plots yielded up to 1 t/ha.**

Establishment conditions were ideal, with excellent rains received in March which continued throughout the growing season (Table 1). Germination was optimal as soil temperatures were warm, and plant growth exceptional for the district given the adequate moisture.

Water stress did not occur during the Minnipa growing season, and the varieties flowered between 7 and 10 weeks. The average height of the lines was 1.3 m. Despite a hot week in October the plants still filled well as adequate soil moisture was available so they were not too stressed. Soil water contents at emergence and maturity are shown in Figure 1.

Yields ranged from 1.7 to 2.9 t/ha, with an average over 2.4 t/ha. Many

of the new lines yielded better than those currently available commercially, while others were disappointing, even under the good seasonal conditions. The grain quality analysis of the Minnipa site showed the average oil content was 43% and the average protein was 42%. This season was exceptional and the data needs to be treated with caution as the Minnipa environment this year was similar to a medium to high rainfall environment.

At Condobolin, under what were very tough conditions, there were some spectacular successes and some abject failures. A total of 120 advanced lines were received and these differed in herbicide tolerance; 28 conventional, 4 Clearfield, 29 Triazine and 59 Roundup Ready.

Establishment conditions were less than ideal, with little rain received in May after sowing (Table 1). There were considerable differences among the lines, a result of variations in seed size and quality. Rain in June and July was sufficient to give good growth and ground cover but August and September were exceptionally dry, so that flowering and seed fill occurred under severe water stress, particularly for later-flowering lines.

Water stress was exacerbated by the lack of stored moisture, following the relatively dry summer and autumn. Soil water contents at emergence and maturity are shown in Figure 2. There was no available water stored below 50 cm in 2009.

Table 1 Growing season rainfall (mm) at Minnipa and Condobolin, 2009

	April	May	June	July	August	September	October	Total
Minnipa	25	35	92	101	29	42	7	331
Condobolin	45	14	53	23	11	17	34	197



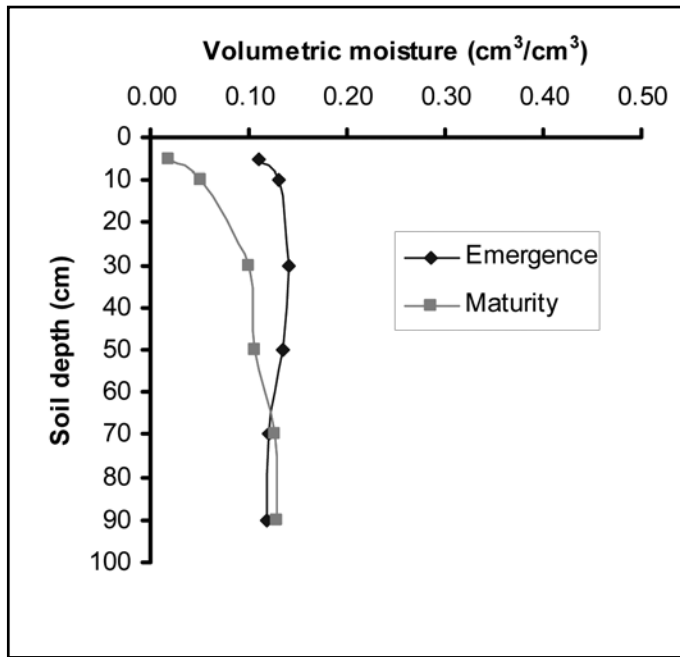


Figure 1 Soil moisture profiles at emergence and maturity at Minnipa, 2009

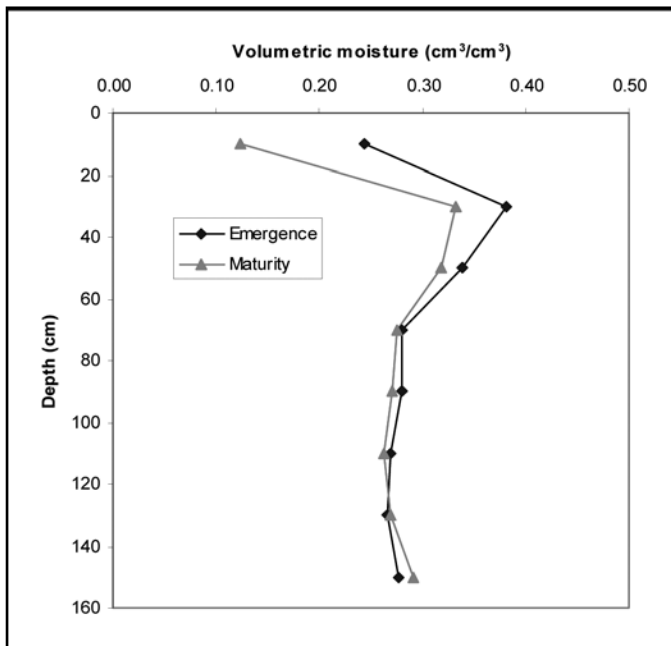


Figure 2 Soil moisture profiles at emergence and maturity at Condobolin, 2009

There was a large spread in flowering time among the entries and many were much slower to flower and begin seed filling than Tarcoola. These later-developing lines suffered greatly under the dry spring conditions and are not suited to low-rainfall regions.

Grain yields also differed among the entries, with individual plots yielding up to 1 t/ha. There was some variability across the site in establishment and water stress and careful spatial analysis will be required to reduce these effects. Despite this variability, it is likely that a number of the entries will be identified as promising for this low rainfall environment.

What does this mean?

Already this Low Rainfall Canola Project work is showing that there is real potential for some of the new material to do much better in the low rainfall environment, increasing the prospects of a more profitable and reliable break crop. The trials will continue in 2010 and 2011 and involve all four breeding companies and sites at Minnipa, Victorian Mallee and Condobolin.

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