

Canola and Mustard in a Dry Environment

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Key Points

- An early break that allows canola to be sown in April is the best option for farmers to grow canola in the rotation in low rainfall areas. Use it as an opportunity crop rather than trying to grow it each year. Mustard is an earlier flowering option and when canola quality mustard is available it may be able to be included more frequently than canola is now.
- Conventional canola cultivars, triazine tolerant cultivars and Clearfield® canola are all suitable for low rainfall areas, but the conventional cultivars have the highest yield & oil content. The other cultivars have weed control advantages.

Low Rainfall Canola Cultivars

There are several types of canola currently available for low rainfall areas. These include conventional cultivars, triazine tolerant cultivars and Clearfield® canola. Each type has advantages and disadvantages that we will discuss here.

Trials conducted at Minnipa and other low rainfall sites between 2001 and 2003 tested a range of early maturing canola cultivars. When looking at these results (Table 1), be aware that oil contents in 2001 were high compared to poorer years and oil contents for 2002 are low. due to late sowing and a dry finish. The season of 2003 was even worse than 2002 with an even later break and then little rain at the end. In future it may be that we need to achieve over 42% oil to avoid a dockage in price.

Early maturing conventional cultivars have been improved over the last few years, with Ag-Outback having a higher grain yield than Monty, but with a lower oil content. Rivette, released in 2001 from NSW Agriculture showed improved yield and oil content. Both Ag-Outback and Rivette are later flowering than Monty. A new conventional cultivar that has been released is 44C11 from Pioneer. This is an early-mid season cultivar that may fit into the low rainfall area but has had little testing so far.

The highest yielding early maturing Clearfield® cultivar in trials in 2001 and 2002 was 44C73 that produced similar yields to the best conventional cultivars. However in the poor season of 2003 the earlier maturity of Surpass 402CL produced higher grain yields than 44C73. Oil content of 44C73 was relatively low compared to the highest cultivars. Surpass 404CL has been released by Pacific Seeds and at Minnipa was very early flowering, similar to Surpass 402CL.

Table 1. Grain yield (relative to Ag-Outback) and oil content (%) of conventional and Clearfield canola cultivars at Minnipa, 2001, 2002 and 2003

Cultivar	Grain yield 2001 (% of Ag-Outback)	Oil content 2001 (%)	Grain yield 2002	Oil content 2002 (%)	Grain yield 2003
Conventional					
Monty	94	39.1	-		
Ag-Outback	100	38.8	100	34.9	100
Rivette	103	42.1	91	35.9	108
Clearfield®					
44C73	102	39.7	80	34.4	94
Surpass 402CL	79	43.1	70	36.8	100

When triazine tolerance (TT) has been crossed into canola it has been shown that there is less radiation use efficiency than in the conventional parent and this results in less biomass at maturity. Grain yields have been shown to be up to 25% lower than conventional cultivars and oil content is reduced by 2-5% (a greater reduction in low oil environments). The other result of incorporating the TT trait into a cultivar is that flowering date is delayed by several days. This is probably the major reason why it has been so difficult to select early maturing TT cultivars.

Two new TT cultivars have been released for 2004. These are ATR-Stubby, a short, early-mid season cultivar that has yielded well in low rainfall areas over the last several years. The other cultivar is Tornado 555 TT from Pacific Seeds, which has not been tested widely. However in two trials at Minnipa in 2003 it yielded similarly to ATR-Stubby.

Where do these cultivars fit?

If you are certain that your paddock is virtually free of broad leaf weeds then the best option is to use conventional cultivars. These have higher yield and oil content.

Table 2. Grain yield (t/ha) and oil content (%) of triazine tolerant canola cultivars at Minnipa, 2001, 2002 and 2003

Cultivar	Grain yield 2001	Oil content 2001 (%)	Grain yield 2002	Oil content 2002 (%)	Grain yield 2003
Karoo	1.32	38.3	0.61	35.2	
ATR-Eyre	1.17	40.5	0.33	33.2	0.28
Surpass501TT	1.22	41.8	0.58	36.1	0.32
ATR-Beacon	1.37	39.3	0.59	35.0	0.33
ATR-Stubby			0.72	36.5	0.40

However, the Clearfield® system may be more applicable if you have a *Brassica* weed problem. The best Clearfield® cultivars nearly match the conventional cultivars for yield and oil but are more

expensive (seed plus herbicide package is about \$80 per hectare). Also the herbicide (On-Duty®) is a group B herbicide that may cause problems if you have resistant ryegrass.

Triazine tolerant canola has been shown in trials to have lower yield than the other canola cultivars and many cultivars have lower oil contents as well. However the cost of the TT package is relatively

inexpensive. On low rainfall alkaline soils only a low rate of simazine (perhaps 1.5 l/ha) will be able to be used due to carry over problems but this rate has been

shown to be very effective at controlling brassica weeds.

The last - two years have shown that sowing date and conditions during the growing season have a major effect on canola and mustard yields. Crops in both 2001 and 2002 were sown in late May or early June. With the exceptional season in 2001, high grain yields were achieved. However 2002 was tougher and much lower grain yields were produced. Sowing in 2003 could only occur in early June and the dry finish ensured very low yields. In order to produce high yields it is necessary that canola be sown as early as possible, given good weed control, and sowing as late as was the case in the last two years is not recommended. The end of the third week of May could be used as a cut-off point for including canola in the rotation because for later sowings, we are relying on a very favourable spring to ensure good yields. An early break that allowed canola to be sown in April is the best option for farmers to grow canola in the rotation in low rainfall areas. Use it as an opportunity crop rather than trying to grow it each year. Mustard is an earlier flowering option and when canola quality mustard is available it may be able to be

included more frequently than canola is now.

The Future

Mustard (Brassica juncea)

Breeding programs for canola quality *B. juncea* (Indian mustard) commenced in Australia in the late 1970s and early 1980s. The programs aimed at producing canola quality *B. juncea* for lower rainfall environments. *B. juncea* has a number of potential advantages over *B. napus*, including enhanced seedling vigour, blackleg resistance and shatter resistance, plus higher tolerance to drought and high temperature stresses. In order for canola quality *B. juncea* to be used interchangeably with *B. napus* in the market place, it has been important to increase oleic acid levels to match the *B. napus* level of 60%. Early maturing, high yielding Australian canola quality *B. juncea* lines are currently being crossed with higher oleic acid sources from Canada. Canola quality cultivars are expected to be available for commercial production by 2005. Initially it is likely that these cultivars will be conventional but additional herbicide resistant types will also be released as has been the case with canola.

Table 3. Grain yield (t/ha) and oil content (%) of mustard lines and canola cultivars at Minnipa, 2001, 2002 and 2003

Cultivar/line	Grain yield 2001	Grain yield 2002	Grain yield 2003
Canola			
Ag-Outback	1.47	0.47	0.62
Rainbow	1.49	0.29	0.45
Mustard			
Non-canola quality	1.34	0.50	0.62
Canola quality	1.15	0.46	0.63
Arid (Canadian)		0.35	0.41

As can be seen from Table 3, in years where canola yields above about 1 t/ha, the mustard lines under test produce lower yields than commercial canola cultivars. However, in years where lower yields are attained such as in 2002, the mustard lines often perform better than canola, although yields were similar at

Minnipa in 2003. At Miltaburra, a selection of canola and mustard were sown on a lighter sandier soil and mustard lines clearly outperformed canola (Table 4).

At present, it seems that mustards that are more likely to produce canola quality grain, produce lower yields than mustards

Section 4.

Low Rainfall Farming Systems

that have lower levels of Oleic acid (the fatty acid that makes canola oil monounsaturated and therefore more healthy to eat). However much of this yield difference is caused by the later flowering caused by crossing Australian adapted mustards to later flowering but

better quality Canadian lines. An example of this is the cultivar Arid that was released in Canada in 2002. This is late flowering and low yielding under our conditions. When earlier, high quality mustard lines are selected it is hoped that higher yields will be achieved.

Table 4. Grain yield (t/ha) of canola and mustard selections at Miltaburra in 2003

Cultivar/line	Canola	Mustard
Average	0.43	0.54
Best lines	0.57	0.77
	(Ag Outback)	(887-1-6-1)
	0.56	0.62
	(44C73)	(JP056)

Canola

We are attempting to select canola lines that are better adapted to low rainfall conditions in SA. Single plants have been selected from our trials at Lameroo in the southern Mallee since 1998, and also at Minnipa since 2002. Those lines with the highest oil content are yield tested at Lameroo and Minnipa. The aim is to test elite lines from these sites in trials throughout Australia and to release cultivars of conventional and TT canola with high yield and increased oil content. As can be seen from Table 5, increased

yields have been achieved in both triazine tolerant and conventional canola lines and oil content has also been increased (data not shown). We hope to release an early flowering triazine tolerant cultivar in the next two years that will give more consistent yields and higher oil content than the currently available commercial cultivars. While there may also be a place for an early flowering conventional cultivar, it is more likely that these lines will be crossed to develop even better triazine tolerant cultivars in future.

Table 5. Grain yield (t/ha) of canola selections at Minnipa in 2003

Cultivar/line	Conventional	triazine tolerant
	0.53	0.40
Best control Highest	(Ag-Outback)	(ATR-Beacon)
	0.72	0.56
yielding line	(BLN2017*SL008-SL101)	(TO094*SP009)

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Category

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Location:

Minnipa Agricultural Centre
Paddock - North 3

Rainfall:

Av. annual: 326 mm
Av. G.S.R.: 241 mm
2003 total: 263 mm
2003 G.S.R.: 204 mm

Paddock History

2003: Canola trials
2002: Barley 2001:
Wheat 2000: Pasture

Soil Type Sandy
loam, pH 8.9