The response of different canola varieties to applied nitrogen

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The aim of this experiment was to compare the responses of six different canola varieties to nitrogen fertilizer.

Summary
Six varieties of canola were tested to compare their responsiveness to urea. The varieties selected had different growth patterns, and the slow growing varieties such as the TT types showed a similar response in growth to the other more vigorous types. In this experiment, urea did not increase yield of any of the varieties tested, but oil contents fell for five of the six varieties with added urea, with ATR Hyden the exception. Given the poor yield response, little can be directly interpreted from these results, although it is reasonable to conclude that higher urea rates are less profitable with lower yielding types or on sites with low yield potential.

Background

With a large number of canola varieties available to growers, the question we wanted to answer was that should growers use the same amount of nitrogen on the different types of canola? The varieties we compared were conventional types (Dunkeld and Rainbow), imi-tolerant (IT Surpass 603CL) and triazine-tolerant (TT – ATR Hyden and Pinnacle) types, as well as lines with the Surpass blackleg tolerance genes (Hyola 60 and Surpass 603CL). Most importantly in this experiment, these varieties had quite different growth patterns, from the slow growing TT lines through to the vigorous types such as Dunkeld and Hyola 60. We particularly wanted to test the idea that the slower growing lines should require less fertilizer and we would expect them to be less responsive to urea. The problem with applying too much urea is that oil contents can fall, and the effects could be worse in the TT types.

Methods

The experiment had six varieties, each with four N rates and was replicated four times. The varieties selected were all mid season types, and the site was sown with superphosphate amended with flutriafol (Impact®) in an attempt to even out the differences in blackleg susceptibility.

The Morton Plains site had 57-kg mineral N in April and the suggested N rate was 40 kg urea per ha. To push this range, we selected rates of 90, 180 and 270 kg urea per hectare plus a control, and these rates were predrilled in mid-May. Due to the delayed break, the experiment was sown on June 15 and the seed was sown at 4 kg/ha. The experiment was sprayed with endosulphan at emergence and was also sprayed for wild oats.

Results

Growth of the treatments was monitored over the season and growth, yield and seed oil contents are shown in table 1. The best varieties were Hyola 60 and Surpass 603CL, and the order of yield was basically the same as the blackleg tolerance ratings. This indicates that the blackleg pressure on the site may have been more than originally estimated, and that the fungicide treatment was not sufficient to control all the disease. Surpass 603CL and Hyola 60 also flowered a little earlier at this site than the other varieties and this would have helped with their higher yields.

Table 1. Varieties used in the experiments, the growth, yield and oil contents measured.

Variety	Type	Blackleg Rating*	Growth t/ha	Yield t/ha	Oil Content %
Surpass 603CL	IT	8.0P	4.31	1.11	42.6
Hyola 60	Hybrid	9.0	4.95	0.99	42.6
Rainbow	Conv.	6.0	3.76	0.85	38.4
ATR Hyden	TT	6.0	3.57	0.71	36.1
Dunkeld	Conv.	6.0	3.85	0.66	40.5
TI-1 Pinnacle	TT	5.5	3.33	0.62	37.3
LSD (0.05)			**0.28**	**0.08**	**0.5**

* from Canola Association of Australia scales

The effect of additional nitrogen is shown in table 2. On this site, the yield was not improved by nitrogen, but the amount of growth did show a small response to the extra urea. Growth during the winter was slow due to the late sowing, and the crop had only reached the 4 leaf stage in early September. These growth patterns are typical in seasons with late starts and early finishes, where moisture severely limits production. 2001 was a decile 2-3 year, with 181 mm of growing season rainfall, and the effects of the drought would have been more significant on the mid-maturity types at Birchip, which is better suited to early types.

Table 2 also shows the net return for the various urea rates used. The price for canola factored in was $370 per tonne, plus oil bonuses, and urea was costed at $450 per tonne. The net return is the gross return less the cost of the urea applied.

Table 2: The effect of nitrogen on the growth, yield and oil contents measured at Morton Plains.

Urea	Growth t/ha	Yield t/ha	Oil Content %	Net Returns $/ha
None	3.70	0.84	40.9	208
90 kg/ha	3.88	0.78	39.2	189
180 kg/ha	4.14	0.85	39.3	222
270 kg/ha	4.04	0.82	39.0	229
LSD (0.05)	**0.20**	**n.s.**	**0.4**	

A similar experiment was conducted at Horsham during 2001 and the results were similar, although the site mean yield was 1.27 t/ha, and that higher yield potential allowed the nitrogen response to be expressed.

Interpretation

The clear message here is that different cultivars have similar responses, although this does not necessarily mean they would have the same urea rates applied. If the response of Pinnacle and Hyola 60 was 25% to 90 kg urea, the Pinnacle yield would go from 0.80 to 1.00 t/ha. The same amount of urea would take Hyola 60 from 1.20 to 1.50 t/ha. So the same amount spent on Pinnacle would only return 60% of the response in Hyola 60, and with lower oil content. In general, a variety with a high yield potential in a situation where the potential can be realised, should be provided with more nitrogen than, say, a lower yielding, less vigorous TT line.

In terms of profitability, there were no differences between the various N rates, and on this site, the best option would have been not to predrill urea. This raises the entire issue of the use of nitrogen on canola. Athough this experiment was not designed to test the effect of splitting N, it is obvious that in seasons like this, once the urea is applied, the money has been spent. Predrilling high rates of urea commits a large expense to the crop before any potential has been established.

In retrospect, in 2001 the best option would have been to put nil urea on, and we could only make that decision if we aimed to split the applications rather than put all urea up front at seeding. Despite this general idea, if seasons are fair to good, having no nitrogen available at crop emergence is likely to be a problem. A compromise between putting all urea up front and risking that money in the face of uncertain seasons, is to put a proportion (say 30%) at sowing, and then as the season develops, making a commitment to top dress additional urea in response to crop demand. A good way to keep an eye on crop demand is to have a test-strip at the full urea rate in the paddock, using that as a check on responsiveness.

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