THE EFFECT OF NITROGEN ON YIELD AND QUALITY OF CANOLA

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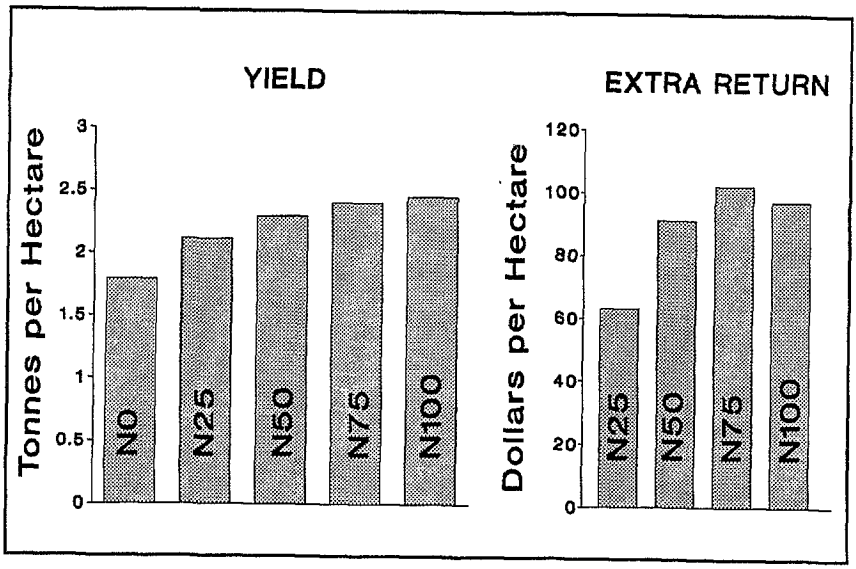
INTRODUCTION

Since 1988 canola has developed to become a most profitable crop for traditional cereal growers in medium to high rainfall areas of NSW, Australia (350 to 550 mm annual average). With the release of new varieties and adoption of better management practices, average yields have increased from 1.3 to 1.7 t/ha. A key to higher yields is to ensure adequate nitrogen is available to the crop. Although canola is normally sown after a dominant legume pasture there is a trend to use it later in the cropping rotation. The result of 17 trials conducted on low to medium fertility paddocks from 1987-89 has shown a 35% yield increase can be obtained by applying 75 kg/ha of nitrogen returning to growers an extra $102/hectare. Results showed that total nitrogen rate was more important than time of application. However there was a trend for oil content to decrease once 75 kg/ha of nitrogen was exceeded. In contrast, protein and total glucosinolates decreased with increasing nitrogen rates.

Table 1. Yield and response to applied nitrogen



MATERIALS AND METHODS

Seventeen trials using standard treatments were conducted within grower paddocks between 1987 and 1989. These sites were medium to low fertility status; because the canola crop was the second or third crop sown after pasture and soil nitrate levels, when sampled in 1988, were all below 15 ppm. The variety Maluka was used in all trials. All nitrogen comparison plots were sown with a standard phosphorus rate. Urea was the source of nitrogen at all times. At various trial sites yield information was obtained on timing of nitrogen, effect of nitrogen on quality, and differences between varieties.

RESULTS

Timing of Nitrogen Application

In 1987 and 1988 twelve trials were conducted to find the optimum split application technique of applying nitrogen to canola. Nitrogen was either applied as urea at sowing (separate operation below seed depth) or at stem elongation usually 10 weeks after sowing.

Table 2. Timing of nitrogen application (12 sites)

Nitrogen (kg N/ha) Sowing/top dress	1987	1988	Average	Yield increase %
0/0	1.79	1.82	1.80	100
25/0	2.13	2.17	2.15	119
0/25	2.13	2.03	2.08	116
50/0	2.24	2.18	2.21	123
0/50	2.34	2.18	2.26	126
25/25	2.33	2.19	2.26	126
0/75	2.47	2.18	2.32	129
50/25	2.53	2.42	2.47	137
25/50	2.47	2.33	2.40	133
75/0	-	2.39	-	

These results indicate:

- yield was effected more by total nitrogen rate than by split application techniques
- in these low to medium fertility sites it was better to have some nitrogen applied at sowing rather than topdressing all at bud formation by when usual deficiency symptoms could be observed.

Effect of Applying Nitrogen on Oil Content and Glucosinolate Level

In 1988 three trials were selected to review the quality of canola oil and meal after increasing nitrogen rates were applied at sowing.

Table 3. The effect of nitrogen on quality of canola oil and meal

Total N rate kg/ha (presow)	Oil content % (8.5% mc)	Protein %	Total glucosinolates (micromoles)
0	40.83	32.69	18.0
10	43.53	31.50	18.3
25	42.40	31.80	18.6
50	42.83	32.39	18.0
75	40.70	38.93	17.4
100	40.03	34.56	17.2
150	39.13	36.80	16.4

The results indicate:

- a trend for oil content to decrease with increases of nitrogen applied at sowing, particularly after 75 kg N/ha. A small reduction in oil content is far outweighed by extra income from increased yields.
- a trend for protein to increase with increases of nitrogen applied at sowing. This is a bonus for stockfeed users of the meal by-product.
- a trend for total glucosinolates to decrease with increases of nitrogen applied at sowing. This is thought to be due to sulphur dilution in larger plants with higher yield potential. No advantage gained as the meal by-product is now well below the standard levels (40) and readily accepted by stockfeed users.

Response of Higher Yielding Varieties to Nitrogen

Since 1988 a new era of canola varieties have been released in Australia, improving yields by 20 per cent to 30 per cent over earlier varieties (NSW core variety trial results 1987-1989). The first variety released commercially was Maluka followed by Eureka in 1989. Two sites compared the yield potential of Maluka to Eureka. There was no interaction between these sites and yields have been averaged (table 4).

Table 4. Canola variety response to nitrogen - 1987

Variety	0	25	50	75	100	125
Eureka	2.04	2.21	2.43	2.59	2.67	2.89
Maluka	1.57	1.92	2.04	2.25	2.41	2.57

Both sites had long cropping histories with nitrate nitrogen in the top and sub soil testing less than 10 ppm. Eureka, when receiving the optimum nitrogen rate of 75 kg N/ha, yielded 15 per cent more then Maluka.

CONCLUSION

Previously, nitrogen recommendations were calculated from guidelines developed from cereal production, and from the knowledge that canola requires more nitrogen than wheat at comparable yield levels. The results of these trials have proven nitrogen can be confidently applied to canola as a sound investment. At the most economic rate, 100% return to capital invested has been obtained. In addition, with the release of higher yielding varieties (Barossa and Yickadee) in 1990, Australian canola production is entering a new era that is well supported by variety and management progress.