Determining the Optimum Amount and Timing of Nitrogen Application for Winter Canola Production on the Southern Great Plains

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Introduction

- Increased interest in winter canola (*Brassica napus* L.) production throughout the southern Great Plains has brought fourth several issues regarding production management, N management being one of those issues. Very little N management research for winter canola production has been conducted in the southern Great Plains.
- Current N recommendation for winter canola production is 0.02 kg N to produce 1 kg canola with one-third applied in the fall and two-thirds in the spring.

Objectives

- Develop N recommendations for winter canola grown in the southern Great Plains, focusing on:
  - ✓Appropriate timing of N application: fall, spring, or split
  - ✓Economic N rate to apply

Methods

- Locations

- Two sets of studies conducted jointly by KSU and OSU during the 2006/2007 canola growing season.
  - Rate and timing studies conducted on research farms (Perkins, OK and Hutchinson, KS)
    - ✓0, 34, 67, 101, or 168 kg N ha^{-1} applied in the fall, spring, or combination.
    - ✓Perkins Site - Fall application rates were adjusted for the 34 kg ha^{-1} residual NO_3-N present.
    - ✓Hutchinson Site - Rates applied were in addition to the 21 kg ha^{-1} residual NO_3-N present.
  - On-farm rate studies (Sterling and Offerle, KS)
    - ✓Sterling Site - 50 kg N ha^{-1} (N application + residual soil NO_3-N) applied in the fall and 0, 34, 67, 101, or 168 kg N ha^{-1} applied in the spring
    - ✓Offerle Site - 106 kg N ha^{-1} (N application + residual soil NO_3-N) applied in the fall and 0, 34, 67, 101, or 168 kg N ha^{-1} applied in the spring
- Urea was used as N source for both fall and spring applications. Fall applications were incorporated prior to planting.
- Canola was seeded at 5.6 kg ha^{-1}.

Results

Nitrogen Application Timing

- Winter canola grain yields were very good at the Perkins, OK site, while an early April freeze reduced grain yields at the Hutchinson, KS site.
- Timing of N application at Perkins did not seem to have an effect on grain yield or winter survival (data not shown).
- At Hutch, having a minimum of 34 kg N ha^{-1} in the fall was critical. Winter survival was greatly reduced with the 0 kg N ha^{-1} treatments.

Table 1. Grain yield at Perkins, OK and Hutchison, KS for fall and spring applied N.

Application Timing		Grain Yield	
Fall N	Spring N	Perkins	Hutchinson
- - - kg N ha^{-1} - - -		- - - kg ha^{-1} - - -	
0	0	2303 a†	254
34	0	-	265
34	34	2336 a	473
34	67	2764 b	706
34	101	2845 bc	648
34	134	2746 c	520
Soil NO_3-N‡ 34	21		

† Means labeled with the same letter for a given depth are not different at $\alpha = 0.05$.
‡ Soil NO_3-N concentration obtained from a 0 to 60 cm composite soil sample.

Table 2. Grain yield at Sterling, KS and Offerle, KS from spring applied N.

	Spring N	Grain Yield	
		Sterling	Offerle
	- kg N ha^{-1} -	- - - kg ha^{-1} - - -	
	0	1,669	1389
	30	1960	1568
	60	1,949	1848
	90	1,770	1949
	120	1,747	1814
	150	1,702	1982
Soil NO_3-N‡		12	50
Fall N Application¶		38	56

† Means labeled with the same letter for a given depth are not different at $\alpha = 0.05$.
‡ Soil NO_3-N concentration obtained from a 0 to 60 cm composite soil sample.
¶ All treatments at each location received the indicated fall N application rate.

Nitrogen Rate

- Nitrogen application increased grain yield up to 122 kg N ha^{-1} when combining the Perkins, Hutchinson, Offerle, and Sterling sites.

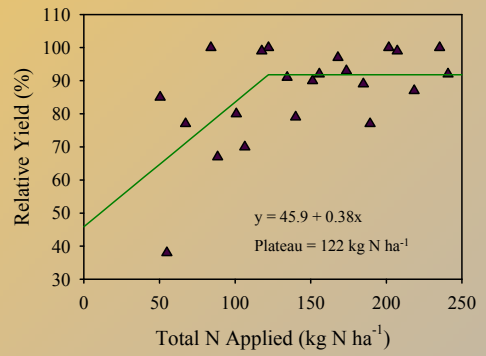

Figure 1. Relative grain yield versus total soil nitrate N plus fertilizer N (Pr > F = 0.01) combining the Perkins, Hutchinson, Offerle, and Sterling sites.

Summary

- Work is on-going and will continue during the 2007/2008 growing season.
- Small adjustments may be made to current N recommendations but no major changes planned at this time.
- Current N recommendations of 0.02 kg N per kg of expected yield still seem appropriate.
- Applying at least one-third of the full N recommendation in the fall is critical.

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