Evaluation of Split Nitrogen Rates and Source on Canola Grain Yield and Quality

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Objective: (1) To evaluate fertility rate and source of N on canola grain yield and quality (2) and to assess the effectiveness of split applied N fertilizer on canola grain yield and quality. Canola was planted on May 27 on 25 feet long and 7-in row plots arranged in an RCBD. Fertilizer treatments were applied as starters and in splits (table 1). All granular treatments were broadcasted, while the 28 percent (UAN) was applied at 4- to 5-leaf stage with a 10 ft spray hand boom. Normalized Difference Vegetation Index (NDVI) was measured with a GreenSeeker™ pocket sensor on same day (June 25) split applications were made. Whole plant samples were taken on July 2 for tissue N test. Plots were harvested August 23, one week after swathing.

Evaluation of canola nitrogen rate and timing

Results

Table 1. Nitrogen fertilizer treatment effect on the grain yield and quality of corn

Trt	N Source, rate (split rate)	Yield	Oil	KWT	% Leaf N	NDVI
	lb N/ac	bu/ac	lb/ac			
1	Check 0	1589 a[3]	48.2 a[3]	0.433 a[3]	3.06 acd[3]	0.43 acd[3]
2	Urea 60 (0)	1886 a	47.5 a	0.449 a	2.90 cd	0.45 acd
3	Urea 105 (0)	2233 a	45.8 ac	0.494 a	3.48 acd	0.49 a
4	Urea 150 (0)	2403 a	45.5 ac	0.523 a	3.55 acd	0.52 a
5	Check 0 + sulfur[1]	1673 a	46.6 a	0.431 a	2.89 cd	0.43acd
6	Urea only 60 (45)	2026 a	46.3 ac	0.455 a	3.14 acd	0.46 acd
7	Urea only 105 (45)	2478 a	46.3 ac	0.434 a	3.81 a	0.43 acd
8	Urea only 60 (90)	2222 a	45.2 bc	0.421 a	3.25 acd	0.42 acd
9	Urea only 105 (75)	2236 a	45.7 ac	0.405 a	3.53 acd	0.41 acd
10	Urea only 150 (30)	2442a	45.6 ac	0.431 a	4.04 a	0.43 acd
11	Urea only 0 (90)	1978 a	45.5 ac	0.386 a	3.23 acd	0.39 bcd
12	Urea only 0 (135)	1889 a	45.3 bc	0.368 a	2.76 d	0.37 cd
13	Urea only 0 (150)	1880 a	43.5 c	0.373 a	3.68 acd	0.37 cd
14	Urea + Agrotain 0 (90)	2088 a	45.7ac	0.371 a	3.09 acd	0.37 cd
15	Urea + Agrotain 0 (150)	2196 a	45.0 bc	0.391 a	3.31 acd	0.39 cd
16	Urea + Agrotain 45 (90)	2095 a	45.4 ac	0.438 a	3.33 acd	0.44 acd
17	Urea + Agrotain 105 (45)	2454 a	45.7 ac	0.416 a	3.51 acd	0.42 acd
18	Urea + Agrotain 150 (0)	2345 a	45.2 bc	0.413 a	3.90 a	0.41 bcd
19	YaraVera 150 (0)	2304 a	45.6 ac	0.465 a	4.01 a	0.47 ac
20	YaraVera 0 (90)	1947 a	45.1 bc	0.408 a	3.28 acd	0.41 bcd
21	YaraVera 0 (150)	1917a	45.2 bc	0.374 a	2.93 bcd	0.37 ac
22	Urea 45 (60 as 28% N)	1794 a	45.6 ac	0.398 a	3.10 acd	0.40 bcd
23	Urea 60 (60 as 28% N)	1884 a	45.6 ac	0.376 a	2.75 d	0.38 cd
24	Urea 90 (60 as 28% N)	1935 a	44.7 bc	0.351 a	3.16 acd	0.35 d
Mean		2079	45.655	5.887	3.319	0.417
Tukey-Kramer's MSD		875.75	2.883	0.1013	0.992	0.1075
Treatment differences, P>F[2]		<.0115	<.0004	<0.0019	<.0001	<.0001
C.V.		16.88	2.357	0.642	11.16	9.635

[1]Recieved 30 lbs additional sulfur on top of 30 lbs S in soil as all other plots except the check 0

[2] Probability of observing an F-statistic > the observed; Indicates significance of treatment differences at $\alpha = 0.05$

[3] Mean values followed by the same letter in each column are not significantly different from each other

Yields were generally good despite some occurrence of drought in the month of July. Grain yields responded well to N rates when N was applied as urea (Figure 1). Measurement of plant vigor by NDVI, and tissue N with the urea applied once at planting, showed good correlation with grain yields. The highest yields were observed when urea was split applied at the rate of 150 lbs N, with 105 lbs applied at planting and 45 lbs at 5-leaf growth stage. This treatment gave a yield advantage of 75 lbs over 150 lbs N that was applied once, at planting. Using PROCGLM in SAS, the ANOVA showed that yield differences were significantly different due to treatment effects (*p<.0115*). However, the pairwise comparison by Tukey-Kramer's mean separation test showed no differences except at the 90 percent confidence level where, 150 lbs N split (105 and 45 lbs) had significantly higher yields than the check. An inverse relationship between grain yields and oil content was observed (figure 2). Evidence from this study indicate that there could be a high yield and economic penalty to apply high N rates in midseason if no fertilizer was applied as a starter (table 1). We advise that these results reflect one season and site only and therefore need additional years of data to draw any meaningful conclusions.

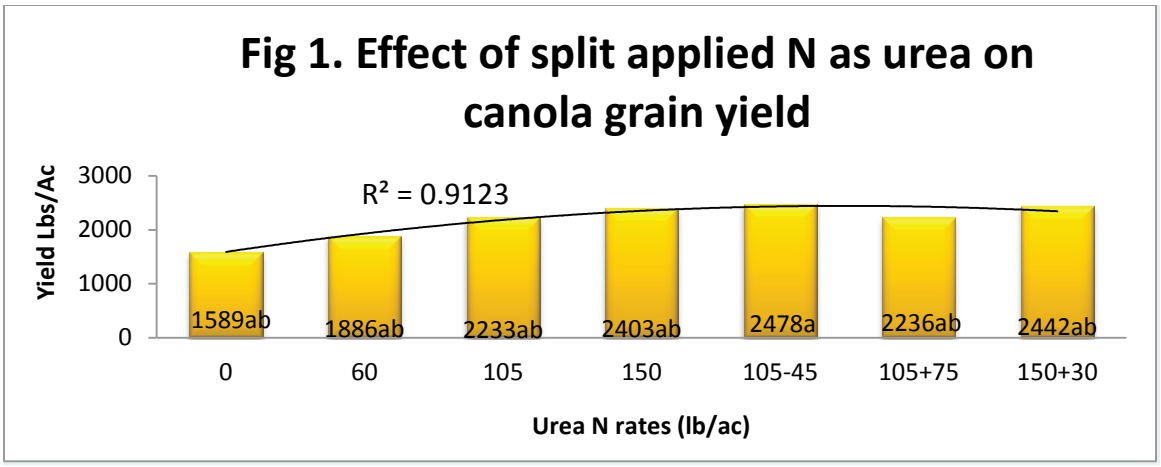
Fig 1. Effect of split applied N as urea on canola grain yield
Yield Lbs/Ac
3000
2000
1000
0
R² = 0.9123
1589ab
1886ab
2233ab
2403ab
2478a
2236ab
2442ab
0
60
105
150
105-45
105+75
150+30
Urea N rates (lb/ac)

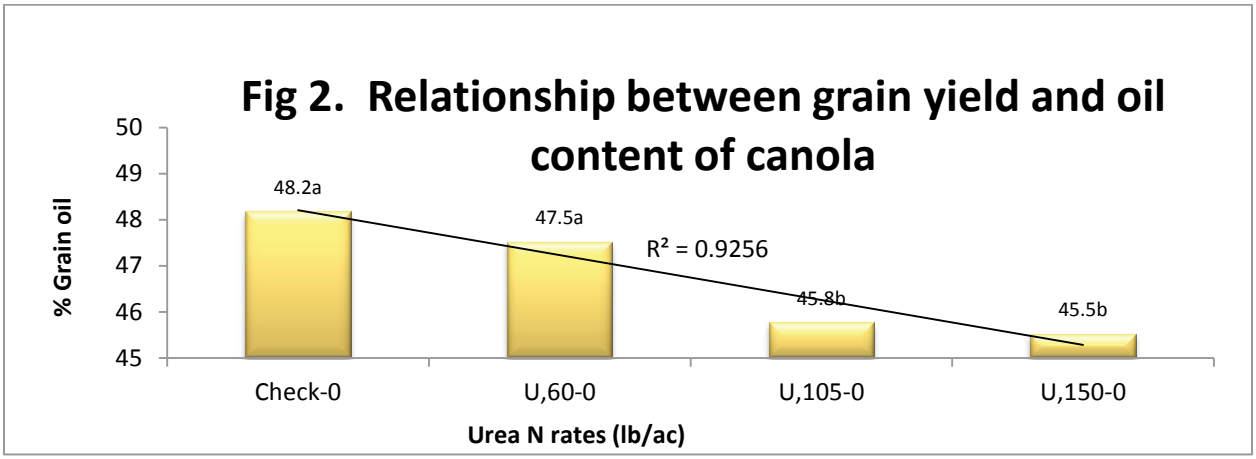
Fig 2. Relationship between grain yield and oil content of canola
% Grain oil
50
49
48
47
46
45
48.2a
47.5a
R² = 0.9256
45.8b
45.5b
Check-0
U,60-0
U,105-0
U,150-0
Urea N rates (lb/ac)