

# Agricultural Demonstration of Practices and Technologies (ADOPT)

## **FINAL REPORT**

**20160471**

### **DEMONSTRATING 4R NITROGEN PRINCIPLES IN CANOLA**

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Demonstrating 4R Nitrogen Principles in Canola  
ADOPT #20160471  
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### **Introduction**

The project compared various nitrogen application timings and products for yield and nitrogen content of the grain. The purpose was to show the benefits to producers of responsible and effective nutrient management using 4R principles to reduce losses of fertilizer N and achieve high yields of canola.

### **Methods**

The trial was seeded on barley stubble on a loam soil with 25 lb/ac soil N available on May 18. There was also 4 ppm of P<sub>2</sub>O<sub>5</sub> in the soil. The non-shattering L140 variety was seeded at 4.5 lb/ac.

There were 12 fertilizer treatments with a base fertilizer N application rate of 108 lb/ac, leaving a total of 133 lb/ac available for the crop. The trial was arranged as an RCBD with four replications. A fertilizer blend of N, P, K, S was applied to all treatments except #1 (133 lb/ac 14-20-10-10). The urea was metered separately into the same fertilizer row. The base urea rate (1.0x) was 196 lb/ac urea. The 0.5x rate was 85 lb/ac urea. The 1.5x rate was 299 lb/ac urea. For treatments 9, 10, 11, and 12 there was 57 lb/ac N as urea applied in a band at seeding and 51 lb/ac N applied at the 5 leaf stage by broadcasting. The UAN was applied using a small sprayer in a dribble band for treatments 6 and 10.

## Treatment List

1. No Fertilizer	
2. 0.5x urea	57 lb/ac total N
3. 1.0x side-band urea	108 lb/ac total N
4. 1.5x side-band urea	156 lb/ac total N
5. 1.0x pre-seed broadcast urea	108 lb/ac total N
6. 1.0x pre-seed dribble band UAN	108 lb/ac total N
7. 1.0x pre-seed broadcast Agrotain	108 lb/ac total N
8. 1.0x pre-seed broadcast Super U	108 lb/ac total N
9. 1.0x split broadcast urea	108 lb/ac total N
10. 1.0x split dribble band UAN	108 lb/ac total N
11. 1.0x split broadcast Agrotain	108 lb/ac total N
12. 1.0x split broadcast Super U	108 lb/ac total N

The trial was harvested on Sept 3 with no shattering losses. Yield samples were cleaned and adjusted to 10% moisture. There was no lodging at the site this year.

## Results

**Table 2. Grain yield, grain N content, and fertilizer use efficiency (N applied / N in grain)**

TREATMENT	YIELD LB/AC	GRAIN N %	FUE
1	883	3.30	n/a
2	2182	3.00	1.29
3	2586	3.33	0.90
4	2346	3.57	0.70
5	2396	3.19	0.80
6	2336	3.11	0.76
7	2254	3.14	0.73
8	2452	3.15	0.81
9	2380	3.24	0.80
10	2524	3.37	0.89
11	2398	3.35	0.84
12	2617	3.35	0.91
<b>LSD</b>	233	0.156	0.10
<b>SIGNIFICANT</b>	yes	yes	Yes

Yields varied depending on fertilizer treatment. The zero fertilizer treatment had significantly lower yield than all other treatments. The half N fertilizer treatment (#2) was lower than most other fertilized treatments but still produced well. The urea

banding treatment (#3) and the split application with various products were generally higher yielding. Treatments 9, 6 and 7 tended to be lower yielding.

Fertilizer use efficiency (%N in grain divided by N applied as fertilizer) was generally higher for the split application treatments. Grain N content was higher in the split application treatments.

There was some noticeable salt stress from treatments 3 and 4 during early growth due to dry spring conditions. After some June rains, the plants appeared healthier. There was no rain to wash in the fertilizer that was broadcast before seeding, so it is likely that losses to volatilization were high for all products applied before seeding.

Based on these results, I would recommend applying split applications of nitrogen with half being banded at seeding. Due to the fact that it rained shortly after broadcast application of the split products, the efficiency of all products including urea and UAN was quite good.

### **Conclusion**

Broadcasting fertilizer before seeding resulted in lower fertilizer use efficiency and likely greater losses to the environment. There was no apparent advantage to Agrotain for yield or grain N content for broadcasting the fertilizer requirement pre-seeding. Given that there was some apparent seedling stress due to high rates of banded fertilizer where all N was banded, a split application would be preferable. This also gives producers the flexibility to assess spring soil moisture following seeding to adjust N application rate. The project was effective in demonstrating BMPs in canola to producers.

### **Extension**

The trial was showcased on the SERF Annual Field Day on July 19. There were about 70 participants who toured the trial. Matthew Bernard, the new oilseed specialist with Saskatchewan Agriculture, gave a talk in the field about the purpose of the 4R initiative. The results will be included in the SERF Annual Report that is distributed to members and local rural municipalities. Results have also been submitted to Fertilizer Canada as part of their contract for this project with SERF.

### **Abstract**

A trial compared various methods of applying nitrogen in canola, including broadcasting urea, dribble banding UAN, and side-banding urea. Split timing of applications were also evaluated. The split applications were high yielding and resulted in the best combination of: low crop damage, high fertilizer use efficiency, and high yield. Fertilizer enhancers like Agrotain and SuperU are relatively expensive and may not be necessary if split applications are timed to coincide with June rainfall. June UAN dribble band application is quite compatible with high-clearance sprayers. This demonstration was effective in showing how 4R principles of nutrient management can be applied in field conditions.