Seed placed fertilizer cautions for canola

A dry spring brings questions about seed placed fertilizer rates for canola. Several factors can cause concern:

- Dryer soils – which increase the risk of seed toxicity.
- Desire to apply sufficient phosphorus (P) to meet crop removal – since many fields have seen decreasing P levels due to high yield. P removal is about 1 lb P205/bu, so high yield potential fields are looking at high P replacement rates.
- Increased use in low disturbance, low seedbed utilization (SBU) drills. Many new openers are arriving on the scene, which are "close-to-seed" sidebanding for which one may need to consider as seedplaced.
- Desire by growers to reduce seeding rates for cost savings. Most research studies investigating seedplaced fertilizer injury were seeded at some 150 seed/m², about double what some farmers are now targeting.

To help assess these risks we should consider past studies.

Background

According to a 2016 survey of 533 Prairie canola growers, most apply the bulk of their nitrogen (N), phosphorus (P) and sulphur (S) at seeding (Table 1). Of current concern are those values bolded – seed placement of phosphorus and sulphur and sidebanded N.

Table 1. The percent of canola acres fertilized at seeding time using different placement options. (STRATUS Ag Research – Fertilizer Use Survey, 2016 Crop Year)

	Nitrogen	Phosphorus	Sulphur
At seeding	91%	94%	84%
Broadcast, not incorporated	1%	1%	1%
Sideband	**46%**	33%	32%
Midrow band	35%	17%	22%
Seedplace	17%	**48%**	**37%**

Values in above chart do not mean ALL fertilizer is applied at these times and placements, but some is.

There have been 2 fairly recent studies looking at seedplaced fertilizer for canola.

Manitoba

Study 1: Seed-placed phosphorus and sulphur fertilizers. Effect on canola plant stand and yield. (Grenkow, Flaten, Grant and Heard)

Findings across 17 site years between 2010-2012.

1. Any seedplaced fertilizer reduces stands – but generally the yield response to applied phosphorus and sulphur more than compensated for stand thinning (Table 1)
2. Stand reduction was greatest when high rates of sulphur was applied as ammonium sulphate, averaging reductions of 15-20 plants/m². Growers should strive to keep ammonium sulphate out of the seed row.
3. Yields generally responded well to both seedplaced P and S and often compensated for stand reductions.

Table 1. Effect of seedplaced fertilizer on canola stand and yield (adapted from Grenkow et al, 2013)

Fertilizer rate and source		Stand reduction		Yield increase	
Lb O205/ac	Lb S/ac	Probability	Stand reduction plants/m²	Probability	Bu/ac
18 MAP	0	6%	-3	47%	7.4
36 MAP	0	6%	-7	35%	7.7
18 MAP	9 AS	12%	-9	59%	10.8
36 MAP	9 AS	24%	-11	71%	13.2
18 MAP	18 AS	35%	-17	59%	11.2
36 MAP	18 AS	41%	-20	59%	10.8
18 S-15	9 S-15	6%	-6	53%	8.8
36 S-15	18 S-15	12%	-11	59%	10.6
36 MAP	18 eS	6%	-8	65%	10.3

From this summary one might wonder what would the yield response have been if:

- Seeding rates had not been 150 seeds/m².
- If sufficient sulphur had simply been safely applied outside of the seed row.
- If phosphorus had been sidebanded rather than seedplaced.

Study 2: Response of canola to the application of phosphorus fertilizer and *Penicillium bilaii* (JumpStart). (Mohr, Holzapfel, Hogg, Mahli and Kirk)

This study compared phosphorus rates and sidebanding (up to 36 lb P205/ac) vs seed placement (up to 18 lb P205/ac) at nine Manitoba and Saskatchewan sites (Table 2).

Table 2. Influence of seedplaced or sidebanded phosphorus on canola stand and yields

Fertilizer rate Lb P205/ac		Stand reduction plants/m²		Yield increase	
Side band	Seedplaced	All 9 sites	4 sites with stand reduction	All 9 sites	4 sites with stand reduction
0	0	0	0	0.0	
9	0	+5	+5	3.2	3.4
18	0	+2	+3	4.2	6.2
27	0	+3	+3	6.2	7.7
36	0	+3	+1	5.3	7.1
0	9	-2	-5	2.9	3.6
0	18	-8	-17	3.8	5.1
18	18	-3	-10	4.9	7.0

Points:

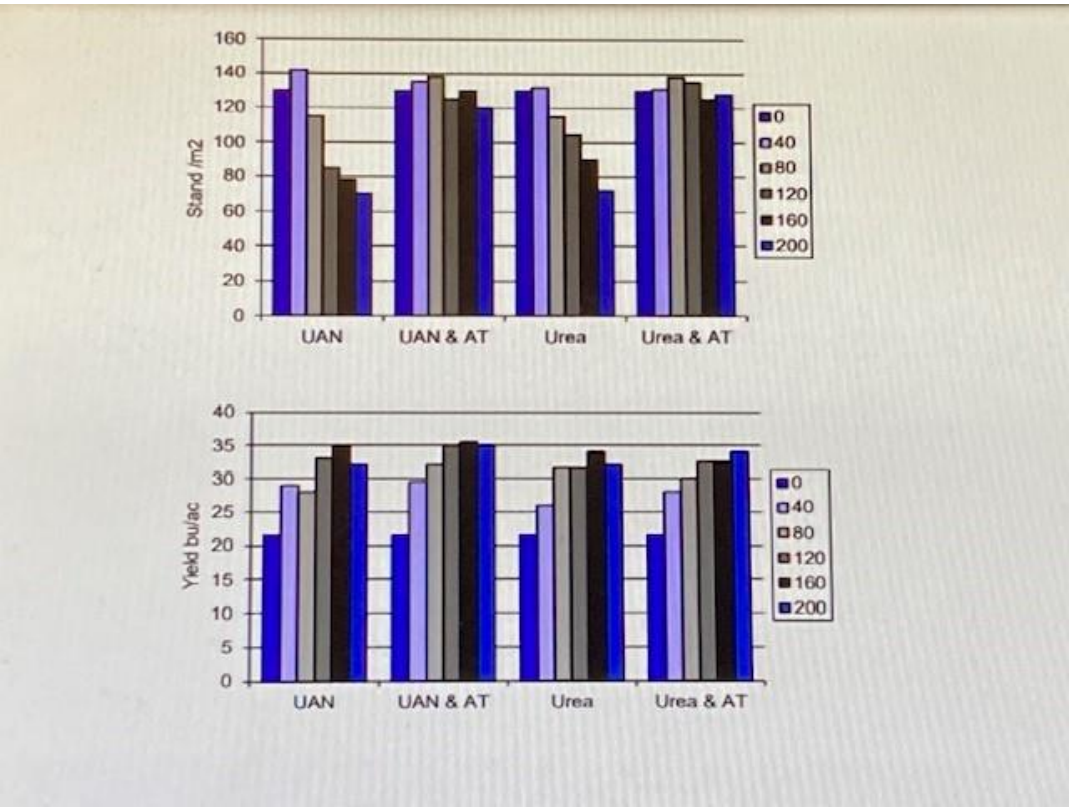
1. High stands were maintained with sidebanded P but decreased with seed placement (significantly reduced at four out of nine sites.
2. At these four sites the reduction was 5-17 plants/m². Yield was not reduced versus sidebanding due to the response to the added phosphorus nutrition.
3. Across all sites the yields with and without JumpStart were equal.

Sidebanded nitrogen (N) is performed by 46% of prairie canola growers. Can sidebanded N cause injury?

Research studies by Dr. Cindy Grant documented considerable canola stand thinning ,when high rates of sidebanded urea or UAN solution was applied (Figure 1-2). Agrotain (AT) served to reduce stand injury, but is no longer supported for this use by the manufacturer.

Points:

- Stands were thinned at even modest nitrogen rates, on a clay loam soil. At high rates, stands were reduced to 50%.
- Crop growth compensated for reduced stands and generally produced as good a yield as the Agrotain protected stands, except at the highest rate.



Figures 1 and 2. Effect of sidebanding high rates of nitrogen (lb N/ac) on canola stand and yield.Three site years on clay loam soil at Brandon. (Grant).

Dr. Grant describes the situation best and I quote here:

"Although sidebanding of seed and fertilizer is generally safe, damage may occur in sensitive crops such as canola. Many seeders are designed to place fertilizer about 1" to the side and 1" below the seed. With wider row spacings, higher fertilizer rates or sensitive crops this spacing may be insufficient and damage may occur in situations that promote seedling toxicity. Risk factors include high pH carbonated soils, soils with low cation exchange capacity (i.e. coarse textured soils with low organic matter), drying conditions after seeding and application on sensitive crops such as canola or flax. If the seed-fertilizer separation is not maintained, risk of damage will also be higher. Seedling damage will not always translate into a reduction in crop yield at the end of the growing season, but yield may be reduced depending on the growing season. Seedling toxicity may delay crop emergence and reduce crop vigour, increasing potential losses from weed competition. Crop maturity may be delayed, leading to greater risk of damage from fall frosts. Crop quality may also be affected. Where risk of damage is considerable, it may be advisable to increase the separation between seed and fertilizer band, consider an alternate method of fertilizer application such as midrow banding or preplant banding or use a less damaging fertilizer source."

Summary comments:

If a dry spring is extended growers may be at risk of canola stand injury by fertilizer placed during seeding. In the above studies stand thinning rarely caused large yield losses. But remember that seeding rates were high – some 150 seeds/m².

References:

Grant, C. and J. Heard. 2004. Spring options for nitrogen fertilization. http://www.umanitoba.ca/faculties/afs/MAC_proceedings/proceedings/2004/grant_spring_options.pdf

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Mohr, R., C. Grant, B. Irvine and C. Holzpfel. 2012. Response of hybrid canola to phosphorus fertilizer and *Penicillium bilaii.* http://www.saskcanola.com/.../Mohr_CARP_SCDC_2010-18_Short_Report.pdf

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