Assessing Crop Stands When Fertilizer is Applied at Seeding

John Heard, Andy Nadler and Scott Day, Manitoba Agriculture and Food

BACKGROUND

- Producers frequently inquire as to the safe rates of seed-placed or “close-to-seed” fertilizers - primarily nitrogen.
- Seed damage arises from ammonia toxicity or salt injury.
- “Safe rate” tables are available through industry and government extension (Table 1), yet for a number of reasons, producers often choose to accept the risk of higher rates.

Table 1. Rates of urea nitrogen (lb N/ac) safely applied with cereal seed if seedbed moisture is good to excellent. (from MAF Factsheet - Guidelines for safely applying fertilizer with seed)

Soil Texture	1 in. spread (disk or knife)			2 inch spread (spoon or hoe)			3 inch spread (sweep)		
	Row Spacing (in.)								
	6	9	12	6	9	12	6	9	12
	SBU[3]								
	17%	11%	8%	33%	22%	17%	50%	33%	25%
Light (sandy loam)	10	0	0	20	15	10	30	20	15
Medium (loam to clay loam)	20	15	10	30	25	20	40	30	25
Heavy (clay to heavy clay)	25	20	10	40	30	25	50	40	30

Additional comments:

- ammonium nitrate (34-0-0) is less damaging to seed than urea. For cereal grain only, N rates can be increased about 20 lb N/ac when ammonium nitrate is used.
- where seedbed moisture is low or weather is hot and windy, reduce rates in table by approximately 50%

METHODS

- The following field project was initiated to help document the extent of stand damage due to fertilizer placement in Manitoba
- as growers contacted MB Agriculture and Food (MAF) offices regarding safe rates of fertilizer, they were invited to participate in the following study:
- During normal seeding operations, growers were to shut off N and/or other fertilizer for one planter width for a distance of about 50’.
- A wide range of seeding and fertilizing systems were involved (Table 2 and Figures 1-2).
- following crop emergence, MAF staff collected comparison plant counts in 3- 1 m lengths of row comparing those rows with vs without fertilizer.

Table 2: Range of seeding/fertilizing systems evaluated

Seedburn Risk factors	Crop sensitivity	SBU	Soil texture	N rate lb/ac	N form	Soil moisture
High	Canola, flax	9-13% (Dutch knife, Bourgault knife)	Sand loam (Miniota)	40-70	Urea, NH3	Drier in late May
Low	Barley, wheat	110-115% (Ridgeland, sweeps) Side banding (Seedhawk, Stealth paired row, Cbi5 Harvest Tech)	Clay loams (Waskada Newdale, Meharry, Plainview, Arborg, Tarno,	0-15	Ammonium nitrate, Ammonia sulphate, MAP, starter blends	Moist – Dry in early May

Seedbed utilization (SBU) is the amount of seedbed over which fertilizer has been spread and reflects the relative concentration of fertilizer with the seed.

SBU is calculated as follows:
SBU = (width of seed & fertilizer spread / row spacing) x 100
The greater the SBU, the more fertilizer that can be safely spread with the seed.

Figure 1. Typical single shoot openers that placed fertilizer with the seed.

Figure 2. Sidebanding option for anhydrous ammonia (Seed Hawk)

OBSERVATION

1 emerged stand counts (plants/sq ft)

Target plant stands in Manitoba are:

- 23-28 plants/sq ft for spring wheat,
- 22-25 plants/sq ft for barley,
- 7-11 plants/sq ft for canola
- 37-56 plants/sq ft for flax

2 differences in growth stages

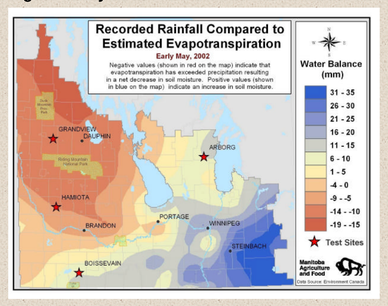
- even when fertilizer toxicity does not thin stands, it may reduce rate of emergence and growth (Figure 3)

Figure 3. Typical Seedling injury from excessive seed placed urea.

RESULTS

- Seedbed conditions were drier than normal in 2002.
- Early May soils were cool and dry. Some seeding was delayed because of the cold soil, and dry weather (waiting for rain). Soils in Western Manitoba were very dry for seeding in the 3rd-4th weeks of May (Figure 4).

Figure 4:May 2002 moisture deficits in Manitoba



SIDEBANDING RESULTS

- The results of 7 side-banded urea or anhydrous ammonia applications are reported in Figure 5 and 6.
- In general - any opener that permitted seed-fertilizer separation produced stands as good as with no fertilizer.
- However, crop emergence and growth was delayed in 2 instances (Figure 6).

Figure 5 Wheat stands in Boissevain area (sidebanded ammonia)

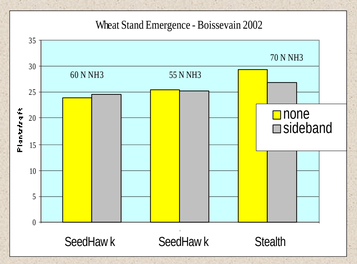
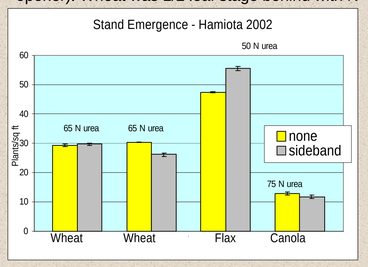


Figure 6 Crop stands in Hamiota area on Newdale clay loam soil (sidebanded with CB15 Harvest Tech opener). Wheat was 1/2 leaf stage behind with N



SEEDPLACED RESULTS

- Seedplaced fertilizer stand counts are reported in Figures 7-10
- Greatest stand reductions were observed at Boissevain (Fig 9) where soils were very dry and even un-fertilized stand counts were well below target populations (Figure 11).

Figure 7. Crop stands in Arborg area on clay loam soils (seedplaced urea, ammonium sulphate).

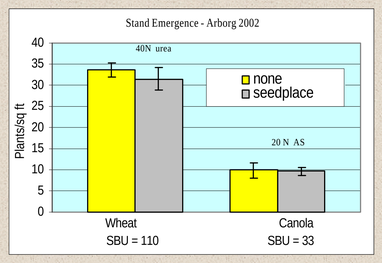


Figure 8. Crop stands in Hamiota area on Miniota sandy loam soil (seedplaced ammonium nitrate with SBU = 9%). Wheat was 1/2 leaf stage behind with N

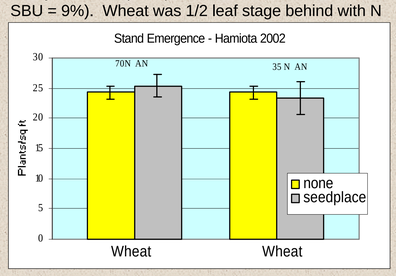


Figure 9. Crop stands in Boissevain area on Waskada clay loam soils (seedplaced urea).

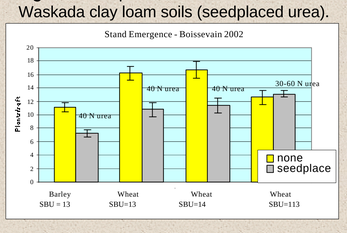


Figure 10. Crop stands in Grandview area on clay loam soils (seedplaced starter blend).

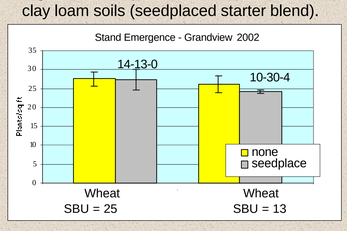


Figure 11. Wheat with seed-placed urea fertilizer on right had only a 69% stand and was 1 full leaf stage behind check strip on left (Boissevain area).

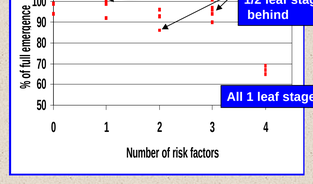
How many strikes were we allowed in 2002?

The risk factors of seed damage are well known. The risk factors were arbitrarily weighted with1 point for each of:

- seedbed utilization (<20% = 1, >20% = 0, sidebanded =-1)
- crop sensitivity (oilseeds = 1, cereals = 0)
- fertilizer source (urea, NH_3 = 1, others = 0)
- N rate (>35 lb N/ac = 1, <35 lb N/ac = 0)
- soil texture (sandy loam = 1, heavier = 0)
- soil moisture at seeding (seeded late May = 1, earlier = 0)

The % emergence and number of risk factors are plotted for all comparisons in Figure 12.

Figure 12. Plant stand as influenced by number of seed-placed fertilizer risk factors.



- It appears that 4 risk factors were sufficient to cause stand thinning and crop stunting in 2002.
- Plant stunting was sometimes evident with fewer risk factors.
- The situations that exceeded the safe fertilizer application rates of Table 1 experienced stand reductions and/or delayed growth.

SUMMARY

- Seed placed N fertilizer caused stand reductions+/or delayed emergence in cases where risk factors were high.
- high N rates applied through side-banding or high SBU operations did not reduce stands
- current “safety” guidelines identified high risk factors
- such a simple “on-farm-evaluation” provides growers the opportunity to assess safety of current fertilizer placement practices.

REFERENCE

- Guidelines for safely applying fertilizer with the seed. Manitoba Agriculture and Food factsheet.

ACKNOWLEDGEMENTS

- Producers in Arborg, Boissevain, Grandview and Hamiota area
- MB Agriculture and Food staff - A Kokolski, S Day, K Watson and J Patterson

Manitoba
Building for the Future