

# by Drs. Adrian M. Johnston and Cynthia Grant

## What About 'One-Pass' Fertilization/Seeding?

Canadian studies with liquids show minimal effect on wheat germination and maintenance of yields. Not so with barley and canola.

*Summary: Results from the first year of a three-year study show that while seed row placement of fluid fertilizer in a narrow band reduced crop establishment and dry matter accumulation of spring wheat, the crop was capable of compensating for this injury. Thus, no grain yield difference was observed at harvest. However, with barley and canola, fertilizer placement close to the seed resulted in damage that persisted through to harvest. Little or no difference was recorded in crop establishment or yield when the fertilizer blend was preplant banded, side banded or dribble banded next to the seed row on the soil surface. Where performance of the surface-applied dribble band was inferior to in-soil bands, end effect was similar for both fluid and dry blends. Results from the first year of this study indicate that surface dribble bands of solution fertilizer blends (N,P,S) were equivalent to in-soil preplant and side-band applications. At Melfort, no difference was recorded in seedling N,P,S concentration. This was reflected in similar final grain yield and grain N, P S concentrations.*

**R**apid expansion in the acreage of crops using no-till seeding in Western Canada has increased interest in using fluid fertilizers in surface dribble bands applied close to the crop row at seeding. Principal reason for using

fluids and this type of placement is to allow for shallow seeding on soils that do not flow smoothly around openers, and avoid excessive soil disturbance common with openers that place a fertilizer band below and to the side of the seed. Other benefits from using fluids include: 1) ease of adapting single-shoot airseeders, thereby avoiding investment in a new air delivery system to double-shoot seed and fertilizer, 2) reduced draft requirement in the absence of banding, and 3) lower risk of seedling damage from inadequate seed/fertilizer separation.

While many farmers start with a solution band of N alone, they soon

move to a complete blend (N, P, and S) to take full advantage of the convenience in product handling. While mobility of N (and to a lesser extent S) allows for easy plant access to these nutrients, soil fixation of P has been a concern to many growers when they consider surface dribbling NPS at seeding.

Spring wheat and canola are the two most common crops grown in the western Canadian Parkland, each occupying approximately 25 percent of the seeded acreage. Current low crop prices have increased emphasis on yield and quality of canola and wheat to whole-farm economics. Ensuring that the canola crop has adequate nutrients

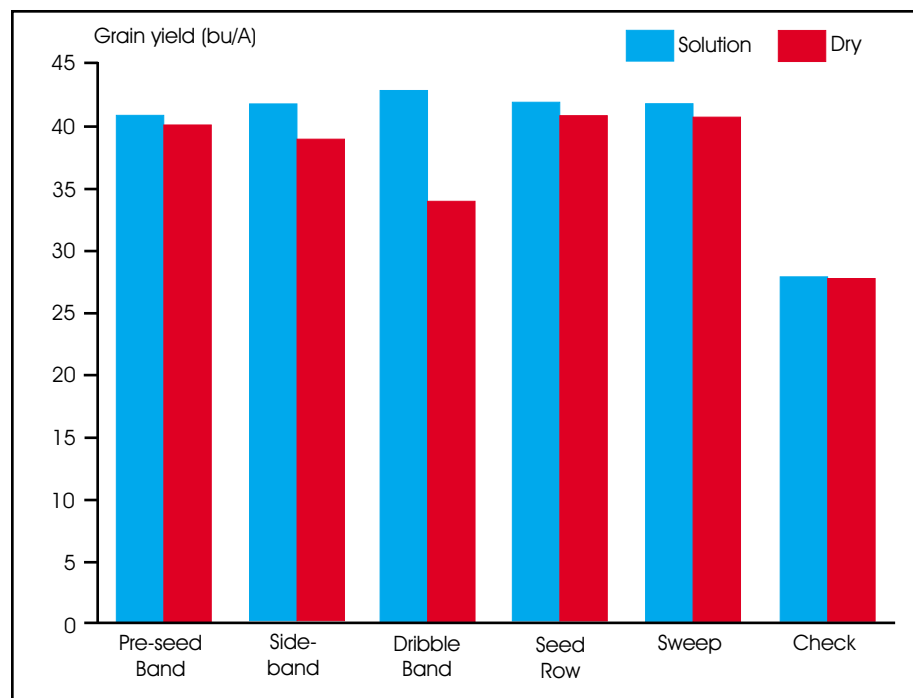


Figure 1. Wheat grain yield, comparing placement and fertilizer source, Johnston, et al, Melfort, 1999.

## Wheat at Melfort

*Germination.* Seed row application of solution and dry blends had a significant negative effect on wheat seedling emergence at both 3 and 5 weeks after seeding. Spreading seed and fertilizer under a 4-inch sweep did not appear to reduce the negative effects of fertilizer placed close to the germinating seed. This was reflected in seedling dry matter yield.

*Yield.* Seedling damage observed with seed row placement did *not* carry through to grain yield. An increase in tillering for seed row treatments provided some compensation to thin crop stands. The negative effects were small by flowering time and gone by harvest (Figure 1).

Although not significant, dribble banding dry fertilizer was inferior to pre-seeding and side band applications, largely due to the poor performance when dry urea was surface applied (Figure 1). Fluid forms showed minor but significant yield advantages in this study. All fertilizer forms and placement methods showed a significant yield increase over the check.

## Canola at Melfort

*Germination.* When emergence was evaluated three weeks post-seeding, canola seedlings showed a 73 percent reduction in plant stand when N was applied in the seed row. This was greater than the 33 percent reduction observed in wheat over the same time period. Spreading seed under the 4-inch sweep significantly improved emergence of seedlings compared to the narrow three-quarter-inch seed row, Dry fertilizer had more of a negative effect on seedling stand than fluid blends. Concentrating the solution band under the sweep when direct seeding may benefit stand by minimizing

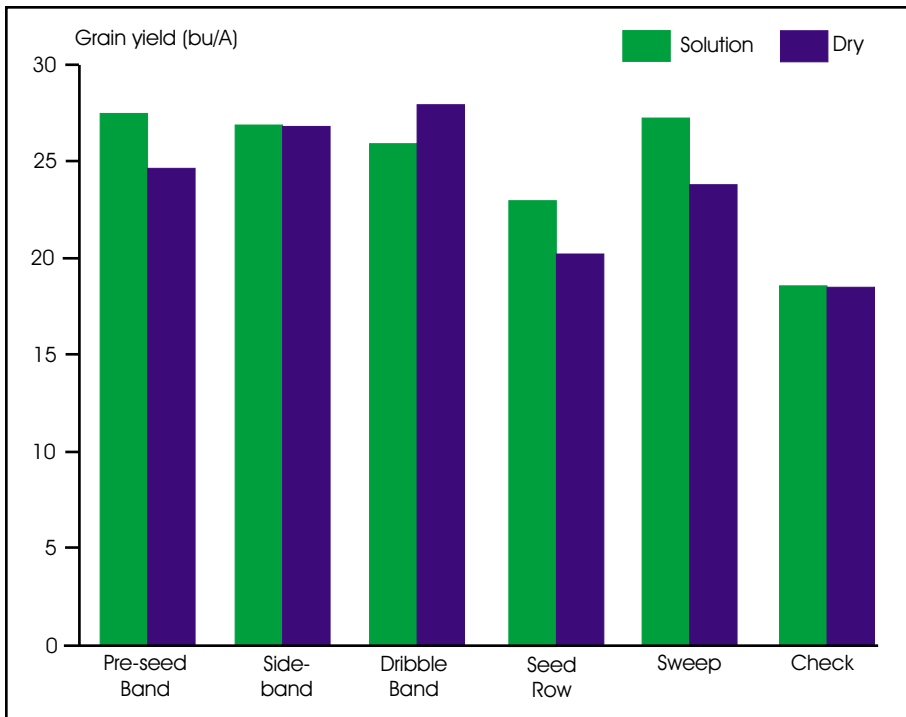


Figure 2. Canola grain yield, comparing placement and fertilizer source, Johnston, et al., Melfort, 1999.

available to it when growing is critical to achieving optimum economic yield.

This research project was established to address:

- Does solution or dry fertilizer (N,P,S) placement influence early season uptake by spring wheat and canola?

- Does fertilizer placement influence whole crop nutrient uptake?
- Does blend placement and form influence yield and quality of spring wheat and canola?

Sites for the studies were Melfort, Saskatchewan, and Brandon, Manitoba.

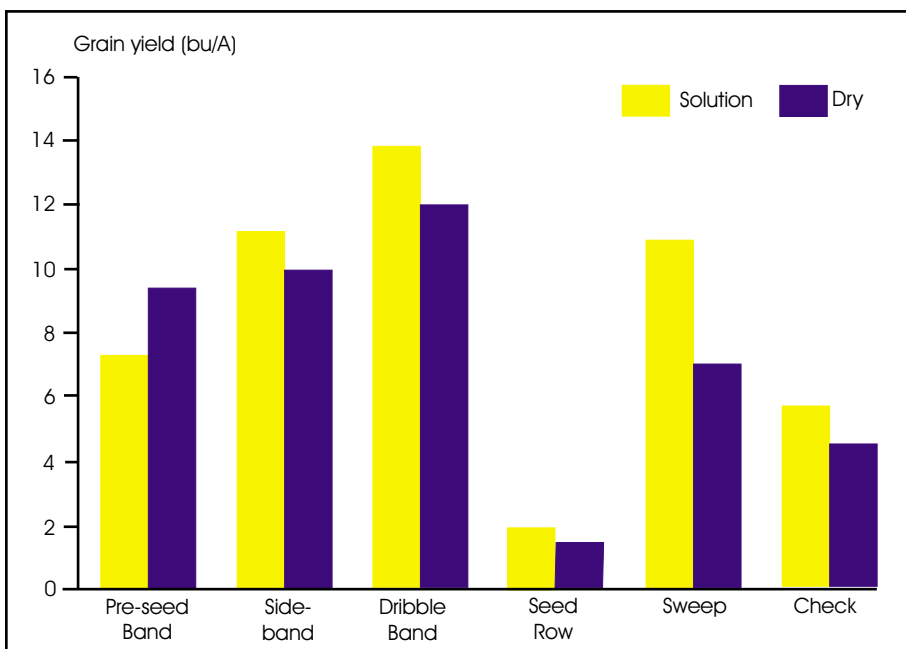


Figure 3. Canola grain yield, comparing placement and fertilizer source, Johnston, et al., Brandon, 1999.

germinating seed exposure to fertilizer. However, the negative effect of seed row application was large in comparison to the other placements considered, regardless of fertilizer form.

*Yield.* Dry matter yield at both the seedling and flowering stages was reduced when placing the fertilizer blend in the narrow seed row. This negative response carried through to harvest grain yield (Figure 2). Spreading the seed and fertilizer under the 4-inch sweep minimized the negative effect of seed-placed fertilizer on final grain yield.

#### **Barley at Brandon**

*Germination.* Barley showed a similar response to wheat at Melfort. Fertilizer placed in a narrow band with the seed reduced crop emergence, as well as flowering dry matter yield.

*Yield.* Unlike Melfort, negative effects at germination carried through

to final grain yield and thousand seed weight. While no significant fertilizer form by placement interaction was recorded for grain yield, placement of dry fertilizer in a narrow band with seed produced 12 bu/A less than a seed-placed fluid. Thus, it would appear the negative effects of dry urea were greater than UAN when placed close to the seed. Spreading under a 4-inch sweep significantly improved crop response, particularly for the dry form.

#### **Canola at Brandon**

*Germination.* Wet soil conditions at seeding were not conducive to the establishment of a good crop. Seedling numbers were very low—even with the unfertilized check. Regardless of fertilizer source, placement in either a narrow three-quarter-inch band or under a 4-inch sweep significantly reduced emergence (relative to check) at both 3 and 5 weeks after seeding.

*Yield.* By the time flowering biomass samples were collected, only seed placement in narrow bands continued to show negative effects, which also showed in final grain yield (Figure 3).

#### **Procedures**

*Soil* was Black Clay Loam at both the Melfort and Brandon sites.

*Seeding* at the Melfort site was on May 29th and at Brandon on June 11th. Site conditions were very wet at Brandon in 1999 due to an extended period of heavy rains. This resulted in delayed seeding.

*Fertilizers.* Fluids were a blend of 28-0-0 + 10-34-0 + 15-0-0-20. Dry were a blend of 46-0-0 + 11-51-0 + 20-0-0-24.

*Nutrient rate.* At both Melfort and Brandon, N was applied at 15 lbs/A, P at 18 lbs/A, and S at 9 lbs/A.

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*Dr. Johnston is currently Western Canada Director of the Potash and Phosphate Institute of Canada.*