



Strip-tillage shows potential for corn production

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Starter P side-banded at planting is beneficial for corn growth, maturity, grain yield, and grain moisture compared to fall deep-banded P. Strip-till corn performed similar to conventionally planted corn, and is a promising practice for soil and moisture conservation in southern Manitoba.

Strip-till equipment moves residue to the side leaving strips of bare soil about 8 inches (20 cm) wide. The soil between the strips is left undisturbed with the residue providing soil and water conservation benefits. In Manitoba, strip-till is often conducted in the fall so that the strips warm up more quickly in the spring.

A two-year research project was conducted in 2015 and 2016 at Carman and Portage la Prairie, MB. The objectives of this study were to determine if:

- starter P fertilization would improve early corn development and increase yields;

- side- banding P in the spring near the seed would outperform fall deep-banded P applications; and
- the agronomic benefits of starter P fertilization would be greater in strip-tillage than conventional tillage due to slower diffusion and root uptake of P in the strip-tillage system.

The field sites were selected based on good surface drainage and low to medium Olsen extractable P soil test. The Carman site was rated low in P fertility (5 to 8 ppm) and the Portage la Prairie site was medium (11 to 14 ppm). Soil samples were also analyzed for nitrogen (N), potassium (K) sulfur (S), and micronutrients, and additional nutrients were applied as needed. Nitrogen was broadcast applied in the spring with a urease inhibitor with a target rate of soil plus fertilizer of 222 lbs N/ac (250 kg N/ha).

After harvest in the year preceding corn, the conventional tillage treatment was tandem disced while the strip-till treatment utilized a Yetter strip-till unit with 8-inch (20 cm) wide strips on 30-inch (76 cm) centers. Three of the site-years had wheat stubble and the fourth had barley stubble.

The P fertilization treatments were a control with no added P, and two application rates of 27 lbs P_2O_5 /ac (30 kg P_2O_5 /ha) and 54 lbs P_2O_5 /ac (60 kg P_2O_5 /ha) of monoammonium phosphate (MAP, 11-52-0).

Fall and spring P application timings were compared. In the fall, P fertilizer was applied as a deep-band 4 to 5 inches (10 to 13 cm) below the soil surface in the strip-till treatment. On conventionally tilled plots, the fall-banded fertilizer treatment applications were first cultivated with a tandem disk, and then P fertilizer was deep banded with the strip-till unit so that fall-banded fertilizer treatments were similar for both tillage systems. These fall fertilizer bands were marked with flags so that the corn could be planted directly over the bands in the spring.

The second application timing was a spring side-banded P treatment that was placed 2 inches (5 cm) to the side and 1 inch (2.5 cm) below the seed with the corn planter for both the conventional and strip-till treatments.

In the spring, corn was planted without additional tillage, but a burndown herbicide application was applied at 2 of the site-years. Corn hybrid Dekalb 26-28RIB Genuity VTDoublingPRO was planted with a corn planter about 1.75 inches deep (45 mm) on 30 inch rows. Appropriate corn herbicides were applied in-crop.

Spring side-banded P was superior

Compared to the unfertilized P control, spring side-banded P was more consistent in increasing early-season biomass, early-season plant tissue P concentrations, and P uptake at V4 growth stage than the fall deep-banded treatments. Reduced days to silking and grain moisture at harvest was similar between the fall and spring application methods. Additionally, throughout the growing season, corn response to side-banded P was more consistent than fall deep-banded P. These responses, though, varied across site-years and declined throughout the growing season.

The 54 lbs P₂O₅/ac rate of starter P fertilizer produced greater early-season response at the V4 growth stage than the 27 lbs P₂O₅/ac rate. Days to silking, grain moisture, and yield were similar for both rates of P when averaged across all site-years, tillage systems, and application methods.

The highest overall average grain yields were produced with spring side-banded P application compared to the control and fall deep-banded P treatments. Averaged across all site-years, tillage systems and P fertilizer rates, spring side-banded P significantly increased grain yield by an average of 7.4 bu/ac (467 kg/ha) compared to the unfertilized control. Spring side-banded P also outyielded the fall deep-banded treatments by an average of 7.5 bu/ac (470 kg/ha). Fall deep-banded P treatments were not significantly different from the unfertilized controls.

No agronomic penalty with strip-till

Comparing tillage systems, tillage did not generally affect early-, mid-, or late-season measurements. Grain yield and grain moisture content at harvest were also similar between conventional and strip-tillage. Strip-till averaged 149 bu/ac (9372 kg/ha) corn yield and conventional averaged 148 bu/ac (9290 kg/ha) across all site-years, application methods and P fertilizer rates.

Overall, the research found that strip-tillage with spring side-banded P placement is an agronomically and environmentally friendly option in southern Manitoba.

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Magda Rogalsky's strip-tillage treatment

Photo courtesy Don Flaten