The Bean Report

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MANITOBA Pulse Soybean GROWERS

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Questions that Emerge When Plants Don't

NDSU Soybean Disease Diagnostic Series

New residue management research further evaluates tillage, burning, stubble height at early and late seeding dates on soybean establishment and yield. See results of first three years here.

Soybeans

Soybean seeding is just beginning in central and eastern Manitoba, although some very early acres are about to emerge in the Pembina region. Soils are warming quickly, reaching temperatures above 10°C at planting depth (5 cm) at many locations averaged over the day (Table 1). Warm soils can increase the rate of soybean emergence, which is risky for those regions with normal spring frosts ending in late May. It is recommended to seed more frost-tolerant crops, such as peas, faba beans and cereals prior to planting soybeans, which are susceptible to frost damage when temperatures dip below 0°C.

With the exception of northwest Manitoba, drier than normal seeding conditions persist which means seed-placed fertilizer is at greater risk of causing seedling damage. The current recommendation is to limit phosphorus (P) placement with soybean and dry bean seed to 10 lbs P_2O_5/ac for narrow rows (<15") and no P for wider rows. Ammonium sulphate, thiosulphate and potash fertilizers have a higher salt index than monoammoium phosphate and should be placed away from the seed row.

Review field histories prior to seeding to ensure an adequate inoculation strategy is used. Recently complete research in Manitoba found soybeans responded positively to inoculant on fields with no history of soybeans, gaining, on average, 15 bu/ac and 4.8% protein. See final report and MPSG's Soybean Fertility Factsheet for more detail.

Table 1. Average soil temperature at 5 cm depth on Tuesday, May 8. (Manitoba Agriculture)

Location	°C
Altona	12.1
Austin	6.3
Beausejour	11.4
Killarney	10.0
Minnedosa	12.3
Russel	11.5
Somerset	15.8
St. Adolphe	11.3
Ste. Rose	8.3
Swan Valley	9.6
Teulon	14.6
Virden	15.4
Waskada	12.1
Wawanesa	17.5

Field Peas and Faba Beans

Seeding of peas and faba beans is well underway in all corners of the province with first reports of pea germination in the central region. With limited soil moisture conditions in most areas, remaining acres should be planted on the deeper end of the recommended range: 3" for faba beans and 2" for field peas, ensuring these large-seeded crops are planted into moisture. Tolerance to seed-placed fertilizer is slightly better for these crops than soybeans and the maximum rate that can be safely placed with the seed is 20 lbs P_2O_5/ac.

Field pea with radicle protruding.

Dry Beans

Dry bean seeding has not yet begun. It is recommended to wait to seed dry bean until the third week of May to maximize yield potential and minimize risk of frost damage.

Considerations for Early Soybean Seeding

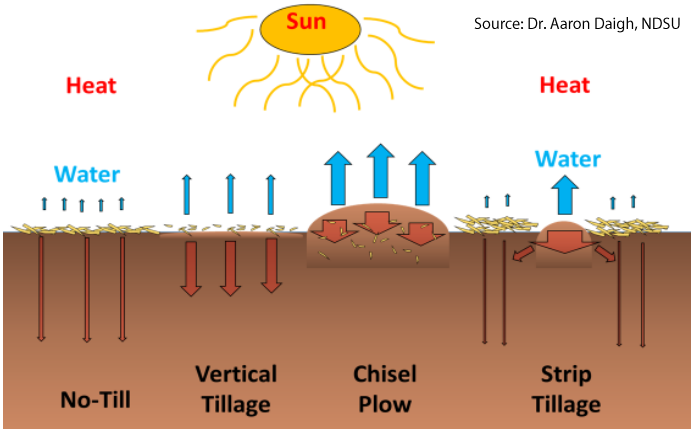
Optimal Window

Deciding when to plant is a balance of the right calendar date, soil conditions, weather forecast and personal tolerance to risk. According to MASC records[1] and local small plot research[2], soybeans planted in early May yield higher than those planted in late May and June. Soybeans are highly susceptible to frost damage, so planting date needs to be considered in tandem with emergence rate and last expected spring frost. A general rule of thumb is to plant soybeans within two weeks of the last spring frost. See map (Figure 1) to find the average date for your region. Emergence rates vary with soil temperature, so beware that soybeans planted into warm soil may emerge in a little as four days (Figure 2).[2]

Planting into soils >10°C is recommended to avoid chilling injury, which occurs in the first 12-24 hours while the seed is rapidly imbibing water. Chilling injury can inhibit or delay germination and emergence, so be mindful of the forecast immediately after planting. Check Manitoba Agriculture's provincial weather stations for an estimate of soil temperature and moisture conditions. Residue management will impact soil temperature so measure soil at planting depth (5 cm) in each field for a few days before planting. Soil temperature fluctuates diurnally so take an average of soil temperature in the morning and evening.

Impact of Residue

To minimize chilling injury, soybeans are often planted into blackened soil. Seedbed preparation doesn't come without cost: discing, vertical tillage or strip tillage costs $19-32/ac, including fuel, machinery and labour[3] and leaves soils vulnerable to erosion and drying.



Source: Dr. Aaron Daigh, NDSU

Soil moisture and temperature dynamics under various tillage regimes. Mulch coverage will conserve moisture by limiting evaporation. Cultivated soils will absorbs more heat during the day. Strip tillage incorporates conservation tillage in row cropping systems, effectively providing the best of both systems.

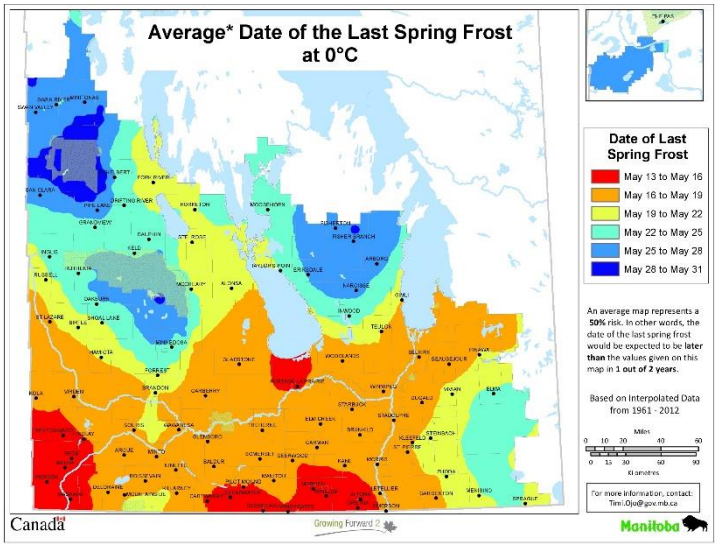


Figure 1. Average date of last spring frost at 0°C in Manitoba.

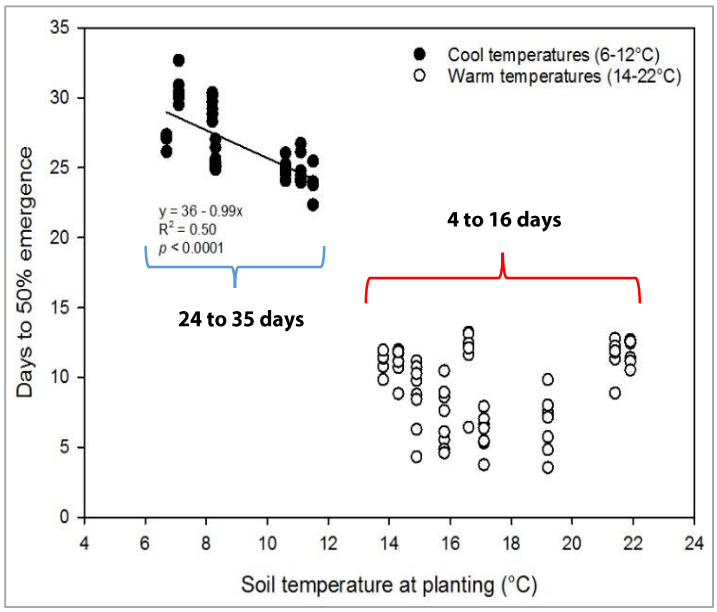


Figure 2. Days to 50% emergence for soybeans seeded into various soil temperatures under field conditions in Manitoba.[2]

Research conducted at Brandon, Carberry, Portage la Prairie and Roblin in 2015-2017 compared tilled wheat stubble to zero-tilled wheat, oat and canola stubble. Despite tillage reducing soil moisture and increasing soil temperatures compared to no-till at about half of the locations, there was no impact on soybean plant population[4]. Effect on soybean yield was also limited and differences observed were not associated with soil conditions[4]. Since most sites were planted on May 17 to 26 and all sites were seeded into soil that was at least 10°C, we can conclude that residue management may have little impact on soybean emergence or yield if planting occurs within the optimum window.

References
[1]MASC. 2005-2013: Seeding Date vs. Average Yield Response. Available https://www.masc.mb.ca/masc.nsf/mmpp_seeding_dates.html
[2]Tkachuk, C.F. 2017. Evaluation of soybean (*Glycine max*) planting dates and plant densities in northern growing regions of the northern great plains. M.Sc. Thesis. University of Manitoba. Winnipeg, MB.
[3]Walther, P.A. 2017. Corn (*Zea mays l.*) Residue management for soybean (*Glycine max* l.) production: On-farm experiment. M.Sc. Thesis. University of Manitoba. Winnipeg, MB
[4]Mohr, R. 2018. Effect of soil temperature at different planting dates, and of residue management, on soybean. Available https://www.manitobapulse.ca/research-project/effect-of-soil-temperature-at-different-planting-dates-and-residue-management-on-soybean/

Seed Treatment Decisions

Seed treatments are available as fungicide-only or combined with a neonicotinoid insecticide. Under high-risk of early season disease and insect pests, seed treatments can improve crop establishment and productivity. However, we are still gaining an understanding of early season pest pressure in Manitoba-grown soybeans. Additionally, neonicotinoids are currently under re-evaluation by the Pest Management Regulatory Agency (PMRA), so responsible use of these products is highly encouraged to avoid losing these control options in the future.

What protection do seed treatments provide?

Insects

Wireworms and seedcorn maggot (Figure 3A) are the only insects that can be controlled by insecticide seed treatment. Fields with a known wireworm history or those that have recently been converted from grasslands are good candidates for seed treatment. However, the presence of wireworms is largely unknown in the province. An MPSG-funded wireworm study is currently underway by Dr. Bryan Cassone in Manitoba to compare trapping methods and determine the impact on soybean crops. Seedcorn maggot has been reported at economic levels in the past, but not every year and only in select fields. Monitor all crops this spring to determine your level of wireworm risk and monitor soybeans, dry beans, peas, corn and canola for seedcorn maggot. Insects that are not controlled by seed treatment in Manitoba include soybean aphids and cutworms (another generalist crop pest).

Diseases

Fungicide seed treatments can protect soybeans from the root rot complex, including *Fusarium* spp., *Pythium* spp., *Rhizoctonia solani* and Phytophthora root rot (*P. sojae*) (Figure 3). All of these diseases infect the seedling stage, but PRR can infect plants at any growth stage. This means that PRR infection outside the window of control will not be prevented by seed treatment. Wet soil is conducive to the entire root rot complex, and all except Pythium prefer warm soil. Other methods of control include crop rotation and variety selection for PRR resistance (Table 2). However, all except for PRR are also common pathogens of pulse crops, which should be taken into consideration when planning crop rotations. Assess pulse and soybean crops for root diseases beginning at the seedling stage to determine your level of risk. See the Soybean Seed Treatment Risk Assessment for more information on these pests.

Table 2. The most prevalent races of *P. sojae* in Manitoba and corresponding resistance genes in varieties currently available.

	Soybean Resistance Gene for PRR				
PPR Race	1a	1c	1k	3a	6
4	S	S	R	R	R
3	S	R	R	R	R
25	S	S	S	R	R
28	S	R	S	R	R

How effective are seed treatments in Manitoba?

Research has been conducted through the MPSG On-Farm Network since 2015 comparing treated versus untreated soybean seed in eastern Manitoba. To date, 29 site-years of data have been collected from this study. Of those 29 site-years, only four had a significant positive yield response to seed treatment (Figure 4). In other words, seed treatment provided a yield benefit 14% of the time in Manitoba. Factors affecting soybean response to seed treatment will continue to be investigated with ongoing trials. This may be an opportunity for farmers to save money in the short-term and be more conservative with these products. However, it is important to pay attention to rising pest pressure due to more frequent and widespread soybean production. Use this farmer-funded research and knowledge of pest pressure to aid your seed treatment decisions in the future.

For more information on this and other On-Farm Network studies, visit manitobapulse.ca/on-farm-network. The database now features single-site reports! Select a report of interest that is nearest to your farm. Note that single-site data should be used in conjunction with combined data for greater statistical power and better-informed management decisions.

Photo: Ric Bessin, U of Kentucky

Photo: Loren Giesler, U of Nebraska

Photo: Cassandra Tkachuk, MPSG

Figure 3. (A) Seedcorn maggot feeding on a soybean stem. **(B)** Soybean seedling infected with *Fusarium spp.* exhibiting root rot and dieback of the taproot. **(C)** Soybean seedling infected with Phytophthora root rot (P. sojae) showing a distinct transition zone on the stem. Symptoms start at the soil level and work their way up the plant.

See NDSU Soybean Diagnostic Series for more detail regarding symptoms and management.

Seed Treatment Decisions continued...

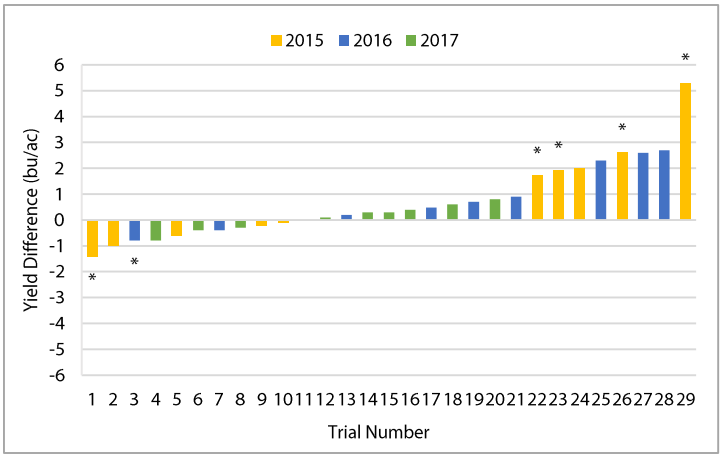


Figure 4. Yield response of treated vs. untreated soybean seed across 29 On-Farm Network site years in eastern Manitoba. Only four out of 29 site years had a statistically significant positive yield response to seed treatment. Treatment included either fungicide + insecticide components or fungicide only

2017 Soybean Disease Survey Results

In 2017, 106 soybean fields in Manitoba were surveyed for root diseases during mid- to late-July. This work was led by AAFC, in collaboration with Manitoba Agriculture and MPSG . Root rot was detected in all 106 soybean fields. Plants from 40 of these fields were then selected for further disease-testing. Of these 40 fields, the most common root disease was *Fusarium* spp. Diseases such as *Rhizoctonia solani* and *Pythium* spp. were not confirmed in any of these 40 fields, suggesting that they should be less of a concern in Manitoba. The same 40 fields were then re-assessed for PRR in mid-August, plus an additional 49 fields. PRR was confirmed in 35% of soybean fields (31/89). These results suggest that we should especially be on the lookout for PRR and Fusarium root rot in soybean crops. Laboratory testing is recommended for disease confirmation.

Preventing Faba Bean Plugging in Air Seeders

Planters or air seeders can be used for faba bean planting, although air seeders pose a greater risk of plugging, damage to the seed and uneven seed depth. Due to the irregular shape and large seed size, plugging can occur at various points in an air seeder—the metering system, distribution system, blockage sensors and soil openers. Solutions to the seed-plugging issue are now available thanks to a study conducted across Saskatchewan by the Prairie Agricultural Machinery Institute (PAMI), funded by the Saskatchewan Pulse Growers.

Plugging at the soil opener was the most common issue, especially when seed tube dimensions were small, the delivery tube inside of the opener changed direction, the hose and opener tube were shingled and the secondary distribution hose was deformed when attached to the opener. Other common issues were plugs at the secondary distribution manifolds, inability to achieve desired seeding rate due to metering limitations and slower ground speed that reduced seeding efficiency.

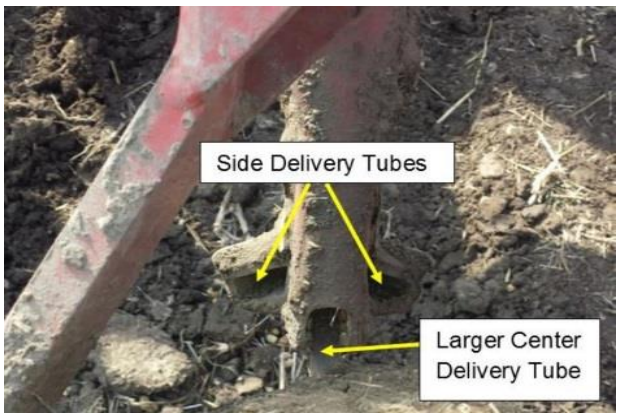


Figure 5. Seed can be routed through the larger centre fertilizer opening of a paired-row opener.

Tips to Avoid Faba Bean Plugging Issues

1. Reduce planting speed to less than 5 mph.
2. Use extra-coarse metering rollers or augers with a large volume between flutes or flights.
3. Increase air flow through distribution system (i.e., set to maximum fan speed, install fan with high airflow capacity).
4. Reduce number of tight turns in the field to prevent innermost openers from reversing in soil.
5. Eliminate sags in distribution hoses and avoid over-tightening hose clamps.
6. Deliver seed via fertilizer tubes, if larger cross-sectional area than seed delivery tubes (Figure 5)
7. Remove inline blockage sensors that may obstruct flow.
8. Meter seed out of two tanks instead of one for desired seeding rate and reduced flow-rate from individual meter.
9. Sieve out largest seeds prior to seeding. Faba bean can vary widely in seed size.
10. Reduce seeding rate if germination and expected seed survival are high.
11. Seed the field twice over at half the application rate.
12. Reduce outside diameter of metering rollers, which increases clearance with metering housing and reduces the probability of seeds jamming between the roller and housing.
13. Use vertical tower-style distribution manifolds. Some are more prone to plugging than others.

Refer to the PAMI report for more info and images.