

## KEEPING THE SOYBEAN HONEYMOON ALIVE

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We keep referring to the “honeymoon” of soybean production in Manitoba, and based on the 2016 growing season, it’s still going strong. We could likely see another provincial yield record and see acres reach two million in 2017. But with wet conditions in eastern Manitoba there were certainly some clues pointing to rough waters ahead. Disease, soybean cyst nematode (SCN), glyphosate resistant weeds and environmental variability are the key factors that could eventually end the honeymoon. How can we be proactive in keeping soybean production profitable and sustainable for Manitoba? The rough waters ahead may not be avoidable, but they can certainly be calmed with crop rotation and good management practices.

### MOST COMMON VS. MOST IMPORTANT SOYBEAN DISEASES

The most commonly diagnosed soybean diseases in Manitoba are shown in Figure 1. The diseases are categorized by colour according to the part of the soybean plant the disease affects – leaves (foliar), stems and roots. Which colour group occupies the largest piece of the pie? As you can see, orange

predominates the pie graph, meaning that currently in Manitoba, the most common soybean diseases are foliar leaf diseases – Septoria brown spot, bacterial blight, leaf spots, downy mildew, cercospora blight, etc. These are the diseases you probably hear most about. The second largest pie piece is green, representing root diseases (seedling diseases, Phytophthora) followed by brown, representing stem diseases (pod and stem blight, white mould).

Now let’s take a look at what the most *economically important* diseases of soybean are in the U.S. What colour predominates the pie chart in Figure 2? As you can see, green occupies nearly 80% of the pie chart. This means that the majority of yield losses caused by disease in soybean are lost to diseases that affect the root – SCN, Phytophthora, seedling diseases, etc. Brown, representing stem diseases (sclerotinia, charcoal rot, brown stem rot) occupies the second largest piece, followed by orange, which is represented by only one foliar leaf disease – Septoria brown spot.

What does this mean? The most common and recognizable diseases in Manitoba are the least impactful when it comes to crop yield losses. We get caught up in differentiating leaf spots and trying to manage with fungicides,

when the real potential for yield loss exists with root and stem diseases. Root and stem diseases build up over time and with shortening crop rotations. Once these diseases become established in Manitoba, there will be no quick fixes like fungicide, so the longer we can keep them at bay, the better. We can start now to take proactive management – with diverse crop rotation and variety selection.

### MOVE OVER LEAF DISEASES, LET’S TALK ROOT AND STEM DISEASES

SCN is the most detrimental disease of soybean worldwide. This nematode has not been detected in Manitoba yet but is expected to show up in the Red River Valley region bordering the U.S. at anytime. For now, we will focus on seedling diseases and Phytophthora root rot, the second and third most detrimental disease of soybean in the U.S. There are several pathogens that contribute to the root rot pathogen of soybean – *Fusarium* spp., *Pythium*, *Rhizoctonia*, and *Phytophthora*. *Fusarium* and *Phytophthora* are the most common in Manitoba soybean fields.

All these pathogens persist in soil and crop residue, infecting soybeans through the root. As soybean is grown

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Figure 1. Most commonly diagnosed soybean diseases in Manitoba (Source: M. Pradhan, Manitoba Crop Diagnostics Lab, 2010–2015)

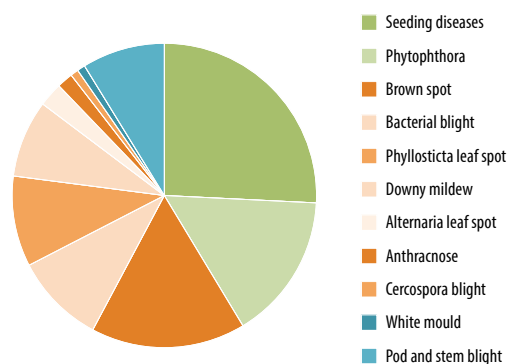
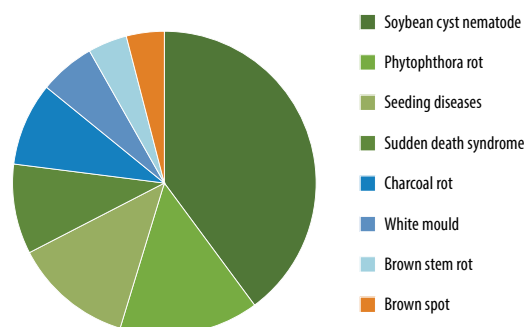


Figure 2. Top eight economically important soybean diseases in the U.S. (Source: Wrather and Koenig, Plant Management Network, 1996–2010)



more frequently, inoculum builds in the soil leading to higher infection when conditions are favourable. In 2016, *Phytophthora* root rot was found in 59% of fields surveyed at an average incidence of 7%. Impact on the crop can range from discreet yield loss (few above ground symptoms but impaired root system limits water and nutrient uptake) to complete plant death at anytime during the growing season. Collectively, *Phytophthora* and seedling diseases account for 25% of soybean yield losses in the U.S. and are likely the most detrimental in Manitoba at present.

### VARIETY SELECTION AND CROP ROTATION ARE KEY STRATEGIES

Genetic resistance for *Phytophthora* is available in about half of current soybean varieties. Resistance traits should be among the top selection factors for choosing a soybean variety, especially in eastern Manitoba or fields with frequent soybean in rotation. It is very easy to identify varieties with resistance to *Phytophthora*. In this issue of *Pulse Beat*, the *Variety Evaluation Guide* is provided. In this guide, you will find the *Soybean Variety Description Table* on page 3. In column “PRR” of this table, *Phytophthora* root rot resistance genes will be listed. Choosing a variety with some type of resistance will help reduce the occurrence and impact of *Phytophthora* root rot in your soybeans. *Phytophthora* does not affect other crops in rotation, so rotating away from soybean for three years is also very effective in reducing the disease. The other three pathogens that contribute to seedling diseases have a wider host range and genetic resistance is not available, however fungicide seed treatments can offer up to three weeks protection after seeding.

SCN can also be prevented with crop rotation and variety selection. Again, if you grow soybeans in the Red River Valley and have a tight soybean rotation, I would encourage you think about choosing a variety with SCN resistance as well (also found in the

*Soybean Variety Description Table*). It will not do any harm to use varieties with SCN resistance even though we haven't detected it. In fact it's possible for SCN to be present in high risk areas without any above-ground symptoms. Symptoms typically don't show up until yield losses exceed 10%.

### WHAT ABOUT SUDDEN DEATH, CHARCOAL ROT, BROWN STEM ROT AND WHITE MOULD?

Sudden death syndrome has not been detected in Manitoba or North Dakota, but is known to cause up to 100% yield loss in Iowa and is usually in association with SCN. This is a disease we do not want showing up anytime soon. Charcoal rot and brown stem rot have been suspected but not confirmed in Manitoba – they are common in North Dakota and are likely present at low levels in Manitoba fields. These three pathogens typically occur late-season and have the potential to severely impact soybean yields once they become established in the province. Crop rotation and prevention of SCN will help slow the development of these pathogens.

White mould caused by *Sclerotinia* has a wide host range of broadleaf crops and is common in Manitoba, especially in a wet growing season. Fortunately, soybeans are less susceptible than other crops like canola or sunflowers. In 2016, white mould was found in 33% of surveyed fields at an average incidence of 9%, the highest we have seen in many years. At an incidence level of 10%, you can expect 3–5 bu/ac yield loss, but this high incidence level is rare.

### ECONOMICS OF CROP ROTATION FREQUENCY

Per long-term Manitoba crop insurance records, soybean planted on soybean produces 95% yield compared to 100% when planted on small grain stubble. Yet, the frequency of soybean planted on soybean is nearly 20%. This is a frightening statistic when it comes building disease pressure and the

implications to yield as discussed in this article. Manitoba farmers have had great success with soybean production and economic returns over the past five years leading to this frequent rotation. But farm profitability needs to be a balance of short-term economics and long-term productivity. For example, when preparing budgets and deciding crop plans, are we taking into account the 5% yield loss if soybean is planted on soybean? What if we knew that by growing soybean on a one to two year rotation, we would see pest pressure increase more quickly leading to 10% annual yield loss in five years, instead of prolonging it to 20 years? The pest pressure will not only be diseases – SCN is at our doorstep and glyphosate resistant kochia is already here.

I encourage you to think about the longer-term implications of crop rotation as you continue crop plans for 2017. It is great to see soybean acres continuing to increase and our job is to help foster this growth and ensure a profitable industry for years to come. We will be able to keep the honeymoon alive by maintaining diversity in crop rotation, choosing varieties with genetic resistance and vigilant scouting allowing for early detection of emerging pests. ■