2017 Growing Season Review

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THE 2017 GROWING season looked very different from 2016, reminding us to be ready for the unexpected when dealing with Mother Nature. The most notable difference between these two seasons was perhaps moisture. However, other unique challenges faced in 2017 made it memorable. This article will discuss the top three in-season production issues for soybeans in 2017, their impact on yield and management considerations for the future.

DROUGHT STRESS

Where 2016 left us with an excess of soil moisture, crops grown in 2017 thrived on it. Accumulated rainfall from May 1 to June 11, 2017 ranged from 22 to 51% of normal for select locations across Manitoba. In general, the month of June is a stressful time for soybeans – plants are already establishing themselves through vegetative growth, combatting iron deficiency chlorosis and developing nodules – processes that consume a great deal of energy and resources. Add dry conditions to the mix and plants are really struggling.

Accumulated rainfall later in the season was much more variable across Manitoba. From May 1 to August 13, 2017, locations such as Emerson accumulated only 38% of normal rainfall, whereas Dauphin reached 90%. Timely rains throughout the growing season were observed in areas of eastern Manitoba. Greater residual soil moisture from the previous year was reported in southwestern Manitoba. These are two scenarios that may have boosted soybean yield in 2017. However, it is difficult to know the yield impact of drought stress alone, due to the interaction of several factors. We can speculate that poor soil moisture exacerbated the effects of other production issues and contributed to reduced yields where they did occur.

One issue to be conscious of in 2018 due to dry conditions is the risk of residual herbicide carryover. Some residual herbicides have two-year re-cropping restrictions, meaning they can injure crops planted the following year. For example, this type of injury can be caused by the clopyralid component of herbicides such as Curtail M and Prestige XC/XL.

Chemicals degrade in the soil by two primary mechanisms: microbial and chemical hydrolysis. Herbicides that require microbes to break down (e.g., clopyralid) also require warm temperatures and soil moisture. Under dry conditions, these chemicals may not break down properly. Therefore, it is recommended to examine field records, environmental conditions and other contributing factors (e.g., soil pH) when planning your rotation this winter. Soybeans are not the only crop susceptible to herbicide carryover.

▼ *Figure 1. Drought-stressed soybean plants with bowed stems and wilted leaves at the 2nd trifoliate (V2) stage on June 13, 2017.*

IRON DEFICIENCY CHLOROSIS

The most frequently asked soybean questions in 2017 surrounded iron deficiency chlorosis (IDC) – a condition caused by temporary iron (Fe) deficiency. Symptoms of IDC include interveinal chlorosis of new soybean leaves, appearing as early as the first trifoliate (V1) stage. Widespread symptoms noticed across the province in June were the cause for concern, leaving many farmers wondering why this year was so bad for IDC, especially when symptoms were seen in some of the more tolerant soybean varieties, as well.

During early development, the seed acts as a source of iron for the young soybean plant. Plants at the first trifoliate stage must switch to soil Fe once the seed source becomes depleted, sometimes causing a lag because Fe is immobile within the plant. Manitoba soils have adequate Fe supplies for soybean production, but certain environmental conditions can reduce the availability and uptake of iron by the plant. Factors that increase the risk of IDC include high levels of calcium carbonate ($CaCO_3$), soluble salt, moisture and nitrate in the soil. Guidelines for IDC risk based on soil test soluble salt and carbonate levels are summarized in Table 1 (also available in the MPSG *Soybean Fertility Fact Sheet*).

▼ *Figure 2. Soybean plants exhibiting symptoms of IDC at the second trifoliate stage on June 19, 2017.*

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Table 1. Field risk of IDC based on carbonate and soluble salt soil test levels.

Soluble Salt	Carbonate (%)		
(mmhos/cm)	0 to 2.5	2.6 to 5	>5.0
0 to 0.25	Low	Low	Moderate
0.26 to 0.50	Low	Moderate	High
0.50 to 1.0	Moderate	High	Very high
>1.0	High	Very high	Extreme

Source: Agvise Laboratories

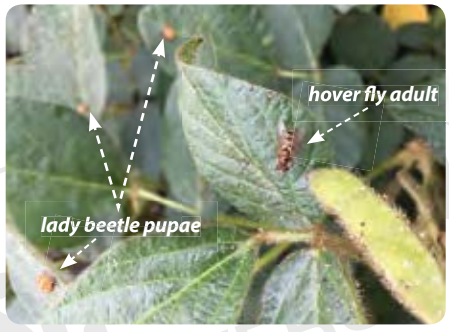
One explanation for widespread IDC in 2017 might be the high concentration of soluble salts brought closer to the soil surface in 2016 by soil moisture. Without timely rains in the spring of 2017, this salt concentration likely stayed in place. Regardless of IDC risk, soybeans are ill-suited to saline conditions and soybean production should be avoided on these fields. For more information on remediation of soil salinity, refer to Dave Franzen's article in the 2017 fall/winter edition of *Pulse Beat* (page 39). Excess soil moisture can also increase the level of bicarbonate (HCO_3-) in the soil, which interferes with Fe uptake and transport.

The best method for controlling IDC is prevention, beginning with field selection. It is recommended to choose well-drained fields with low IDC risk, based on low soluble salt, carbonate and nitrate levels. Variety selection is the next line of defence. If fields are at moderate to high risk, select a more IDC-tolerant soybean variety (refer to these resources – *Seed Manitoba*, *MPSG Pulse and Soybean Variety Guide*). According to research, IDC can also be reduced by in-furrow iron chelate (FeEDDHA) products and cover cropping.[1] However, field and variety selection are the superior methods for IDC prevention.

SOYBEAN APHIDS

Another significant production issue this past year was the infestation of soybean aphids. Aphids are not considered a soybean pest every year in Manitoba because they are not known to overwinter here. Agronomists have been questioning if this is still true for Manitoba, which may be important for researchers to address in the near-future. But to date, we do know that they overwinter on buckthorn in areas of the United States, such as southern Minnesota, southern Wisconsin, Iowa, Illinois, Indiana, Ohio and Michigan.[2] It is likely that winters in Manitoba are too cold for egg survival. When soybean aphids are present in Manitoba, it means they arrived by southern winds in July to August. Some also speculated that soybean aphids arrived earlier than normal in 2017. This is possible due to the hot, dry conditions ideal for aphid movement and reproduction.

▼ *Figure 3. Beneficial insects – hover fly adult and lady beetle pupae, in an aphid-infested soybean field with sticky, shiny leaves on August 2, 2017.*



A new tool called the *Aphid Advisor App* was added to our arsenal in 2017. It was developed by the University of Guelph and OMAFRA. This tool generates a recommendation to *spray* or *don't spray*, based on population counts of aphids and beneficial insects.

Thresholds have been well-established in the literature. The established action threshold is 250 soybean aphids per plant and increasing across 80% of the field. This threshold was designed to allow a one-week window for control before aphid populations exceed the economic injury level (i.e., economic threshold) of 670 aphids per plant. The economic threshold is defined as the point in which the cost of control is equal to yield loss. However, both thresholds do not account for beneficial insects that consume aphids. The main predatory insects are accounted for in the app, including lady beetle adults and larvae, lacewing larvae and adults, hover fly larvae (syrphids), minute pirate bugs (orius), the aphidoletes fly and parasitic wasps, which cause aphid mummies. These insects can also be found in Manitoba, confirming the relevance of this app.

A relatively new concept for some farmers and agronomists this year was "aphid days," discussed by John Gavloski of Manitoba Agriculture in the *Insect and Disease Report* this past season. Aphid days are a unit of measure used to estimate yield loss from soybean aphids. One aphid day refers to one aphid feeding for one day. Therefore, 10 aphid days could mean 10 aphids feeding for one day, or one aphid feeding for 10 days. Research has shown that soybean yield may be reduced by 6.88% for every 10,000 aphid days accumulated.[3] For example, if 500 aphids per plant on average feed for 15 days (7,500 aphid days), 5.2% yield loss could be expected. This puts into perspective the excessive amount of aphid feeding required to cause economic yield loss and warrant foliar insecticide.

An integrated pest management approach is the best long-term strategy for avoiding economic loss from aphids. This includes timely scouting, following thresholds and conserving beneficial species, both predatory and non-predatory (e.g., honey bees) in crop and

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non-crop habitats. Plans for a soybean aphid fact sheet are in the works at MPSG and Manitoba Agriculture. The goal is to provide improved scouting, threshold and management information for emerging topics such as pyrethroid resistance, variety resistance and neonicotinoid insecticide seed treatments, based on recent research. For example, previous research reported that insecticide seed treatment can persist for 46 to 49 days in soybean plants.[4,5] More recently, a robust study conducted across seven midwestern states, determined that neonicotinoid levels declined dramatically within 20 days of planting.[6] Overall, seed treatments are not recommended for control of aphids due to the late date of their arrival in Manitoba.

MPSG PLANS

At MPSG, the research and production team has been busy working with other soybean and pulse specialists at the University of Manitoba and Manitoba Agriculture to create more production resources. The latest resources available to you are the *Dry Bean Growth Staging Guide* and the MPSG Bean App *Harvest Loss Assessor* for soybeans. Resources to watch for in the future include detailed fact sheets for soybean insects and diseases, a field pea staging guide and a fact sheet for managing volunteer canola in soybeans. Suggestions for new, agronomic decision-making tools are always welcome. ■

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