The Bean Report

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MANITOBA Pulse Soybean GROWERS

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Soybeans at first trifoliate (V1) damaged by hail on June 14, 2018.

Soybeans

Soybeans are generally between the first to third trifoliate stages (V1-V3) and most have received an in-crop herbicide application. Post-emergent rolling operations may still safely occur during the warmest part of the day, but should not be conducted later than the V3 stage. Plant establishment appears to be very consistent across Manitoba with low overall levels of root rot and seedling disease reported at this point in the growing season. Continue to monitor for Fusarium and Phytophthora root rots which may intensify with higher moisture levels through June and into July. Assess iron deficiency chlorosis (IDC) severity once soybeans reach the V1 stage. See page 3 for IDC causes, impact on yield and management options. Nodule assessments may also begin at later vegetative and early reproductive stages (see page 2 for more details on assessment methods).

A severe hail event occurred on Thursday, June 14, 2018 along highway 23, from Minto to Somerset, with other scattered pockets of damage further south and east. Severely damaged crops with shredded stems and near complete defoliation had not shown regrowth as of June 18. If any of the plant's growing points are still intact, re-growth is possible, despite defoliation. See page 4 for research summary outlining the yield potential of hail damaged beans.

Dry Beans

Dry bean staging is slightly behind soybeans, at the first to second trifoliate stage (V1-V2) and in-crop herbicide applications will likely be completed later this week. In-crop herbicide products have various crop staging requirements and some have a narrow application window. For example, bentazon can be applied after V1, imazethapyr may be applied up to and including V2, Viper ADV must be applied between the fully expanded 1st to fully expanded 2nd trifoliate while Permit can be applied anytime prior to flowering. Due to the relatively dry conditions, there is a fair amount of surfactant burn and crop injury from herbicides this year. After application, be sure to assess herbicide efficacy and take note of any weed escapes.

Field Peas

Pea stages range from the tenth above-ground node to forming flower buds (V10-to R1). Although tendrils are beginning to knit together, crop canopy is not yet closed. Second in-crop herbicide passes have been required in some fields with flushes of volunteer canola after rainfall in early June. No reports of pea aphid have been made yet this season, but scouting for the pest has only just begun (see page 3 for scouting methods and thresholds). Nodules are beginning to form on pea roots and nodulation should be assessed prior to the end of June. Leaf miner feeding was evident on lower leaves in field peas in southwest Manitoba last week. These insects feed between the leaf epidermal layers but do not cause economic damage (see SPG's Leaf Miners in Peas for more information). Continue to monitor foliar disease symptoms and see page 2 to help determine if a foliar fungicide application is warranted.

Leaf miner damage in peas.

Faba bean at the 5th leaf stage.

Faba Beans

Faba beans have five to eight leaves unfolded. In-crop herbicide applications continue to be applied this week. Scouting activities should include plant stand assessment (optimal range is 160-180,000 plants/ac or 40-45 plants/m^2), herbicide efficacy and foliar disease symptoms (e.g. chocolate spot).

Assessing Soybean Nodulation

Timing

Regardless of the inoculant strategy used or field history, assess soybean root nodulation each year in every field. The ideal stage to check for adequate nodulation is at R1. Assessment at this stage will give a clear picture of whether or not a crop has sufficient ability to produce its own nitrogen (N) via biological N fixation. The critical growth stages for adequate N supply in soybeans is R4-R5 to maximize yield.

Figure 1. Soybean root nodule that is actively fixing atmospheric N.

Method

- Select 5-10 random, representative plants in different areas of the field.
- Use a shovel to gently dig out each root system, as nodules may be present on the taproot and lateral roots. Nodules can easily be stripped from the plant during extraction, especially if the soil is dry.
- Soak the roots in a pail of water to remove soil.
- Count the number of nodules per plant. If you are seeing wide variation between nodule counts, select more plants for an accurate estimate across the field.
- Cut a few nodules open. If the nodules are pinkish-red inside, they are actively fixing N (Figure 1). Leghemoglobin in the nodules, like hemoglobin in blood, is produced by rhizobia bacteria during N-fixation and turns colour when exposed to oxygen.

What is considered adequate nodulation?

Results from a recent MPSG study evaluating various inoculant products, rates, formulations and combinations found that at least 10 nodules per plant were required to reach 90% of maximum yield (Figure 2) (MPSG 2018).

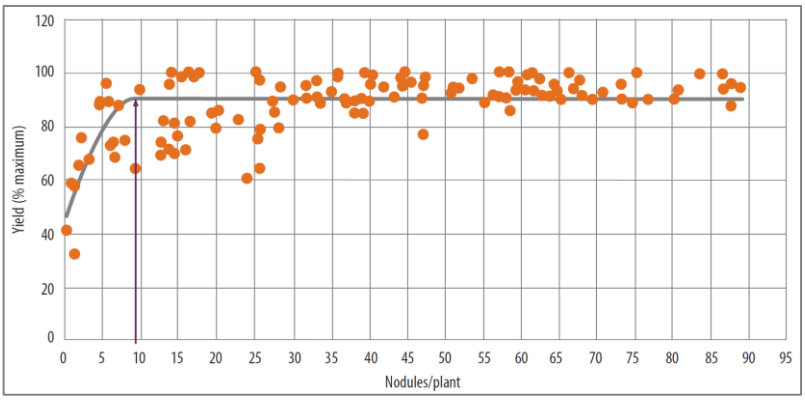

Figure 2. Relationship between number of nodules per soybean plant and relative yield (as a % of the maximum).

Foliar Fungicide Decision Making in Peas

Begin scouting for foliar disease symptoms in peas at late vegetative stages and throughout flowering. Mycosphaerella blight (Figure 3) is the most prevalent foliar disease in Manitoba. Sclerotinia and downy mildew are less frequently and less severe. Foliar fungicide application for control of Mycosphaerella blight should be made at early flower (when one flower is opened on most plants) (Figure 4). The aim is to target fungicide application on leaves in the lower canopy, so spray just before the canopy begins to close. If disease symptoms spread to the mid and upper canopy, and warm humid weather persists, apply a second fungicide application 10-14 days later using a different mode-of-action. Small plot and on-farm research conducted by MPSG found that a single application often increased pea yield, but a second application was less likely to have a significant impact (Table 1).

Trouble deciding if you should invest in a fungicide application this year? Check out the Fungicide Decision Support Checklist to determine your risk of yield loss from Mycosphaerella blight.

Photo: Robyne Bowness, Alberta Agriculture

Figure 3. Mycosphaerella blight on field peas.

Figure 4. Pea flowers open from bottom up.

Table 1. Yield response to foliar fungicide in field peas in on-farm and small plot trials across Manitoba in 2015-2017 (see full report here).

Site	No Fungicide	One Application	Two Applications
On-Farm Network Trials			
Montcalm 2017	58.5[b]	64.5[a]	-
Roland 2017	48.4[b]	56.7[a]	60.4[a]
Wallace-Woodworth 2017	-	43.4	43.7
Rockwood 2017	80.1[b]	82.1[a]	-
Two Borders 2017	51.7	55.0	53
Rhineland 2017	-	64.4[b]	73.4[a]
Small Plot Trials			
Minto 2015	91.4[b]	95.6[a]	97.1[a]
Minto 2016	14.7[c]	16.2[b]	19.9[a]
Hamiota 2016	46.8[b]	48.9[b]	53.8[a]

[a-c] Means followed by the different letter within a row are statistically different at $p<0.05$.

Iron Deficiency Chlorosis

Iron deficiency chlorosis (IDC) is a common sight in soybean crops each year. It appears as interveinal chlorosis (yellowing), or in extreme cases interveinal necrosis (browning). Symptoms show up in soybeans as early as V1 (1st trifoliate), but plants will often recover from this condition. Monitor the patterns, persistence and severity of IDC in your fields. If soybeans recover by V5-V6, yield loss should be minimal (Goos, NDSU).

Causes

Prior to V1, the cotyledons supply stored iron (Fe) to the soybean plant. Once this source of Fe is depleted, plants must acidify their root zone to access it in a plant-available form from the soil. Despite the abundance of Fe in Manitoba soils, factors such as calcium carbonates, soil moisture, soluble salts and nitrates can impede its uptake into the plant. See Table 2 to determine your risk of IDC based on soil test carbonate and soluble salt levels. IDC was unusually widespread in 2017 and symptoms are now starting to show again in 2018. A year like 2016 can bring soluble salts to the upper soil profile. If dry conditions follow, we would expect these salts to remain in place, increasing the risk of IDC. The good news in Manitoba is that moisture is not always in short supply.

Impact on Yield and Management

According to research by Dr. Jay Goos at NDSU, soybean yield was reduced by 9-19 bu/ac for each one-unit increase in chlorosis rating (Figure 5). In other words, more IDC means greater yield loss. However, even low IDC scores resulted in substantial yield loss.

The best way to manage IDC is to prevent it, according to Dr. Goos. And the best method of prevention is currently variety selection. Soybean cultivars vary in their ability to acidify their root zone and take up iron. If your soil test carbonate and soluble salt levels meet at a "high" risk category in Table 2, aim to select more tolerant varieties. Iron chelate products are also on the market for IDC prevention. Dr. Goos' work showed that in-furrow Fe-chelate products may offer some control if used in conjunction with tolerant varieties. However, foliar sprays proved to be ineffective, as Fe is unable to translocate within the plant (Figure 6).

Table 2. Risk of IDC in soybeans based on soil test carbonate and soluble salt levels.

Soluble Salt (mmhos/cm)	Carbonate (%)		
	0 to 2.5	2.6 to 5.0	>5.0
0 to 0.25	Low	Low	Moderate
0.25 to 0.5	Low	Moderate	High
0.5 to 1.0	Moderate	High	Very high
>1.0	High	Very high	Extreme

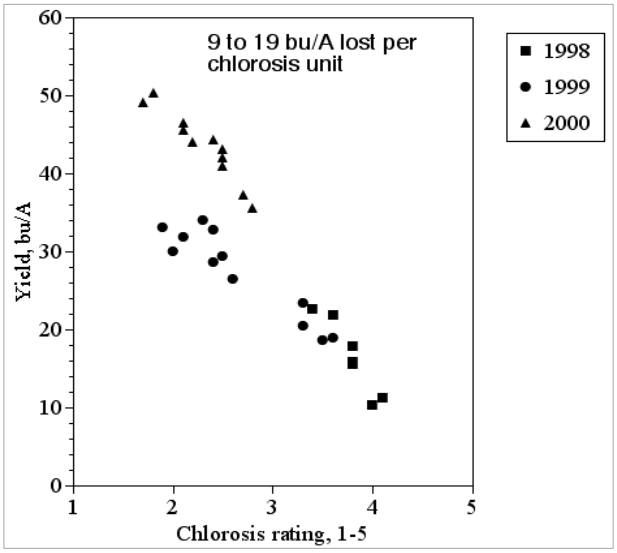

Figure 5. Relationship between soybean yield and IDC rating, where 1 = green leaves and 5 = severe chlorosis and a stunted growing point.

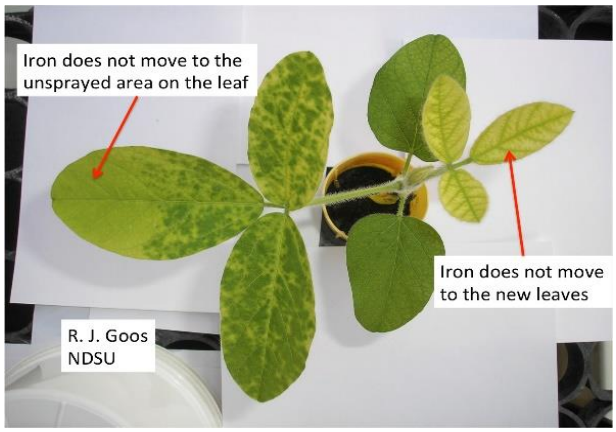

Figure 6. Soybean trifoliate leaflet half-covered with post-it note then treated with foliar Fe spray (left) vs. untreated trifoliate leaflet (right).

Scouting for Pea Aphids

Pea aphids are a sporadic pest in Manitoba, which overwinter in perennial legumes. Newly hatched adults fly to neighbouring pea crops and cause yield loss by feeding on peas during the pod formation and elongation stages, reducing seed formation and seed size.

Timing and Method

Begin scouting towards the end of June to early July, when 50-75% of the crop is in early flower. At four locations in each field, check five plant tips (top 8 inches) or conduct 10 sweeps using a sweep net. Counts should be >50m apart. Populations may be higher near field edges.

Threshold and Control

The economic threshold was developed in Manitoba, using Century peas. The threshold is 2-3 aphids/plant tip or 90-120 aphids/10 sweeps, but varies with control cost and pea price.

If threshold is reached, apply registered foliar insecticide (Movento, Matador, Silencer, Voliam Xpress, Malathion, Lannate, Lagon or Cygon) at early pod. Natural enemies such as lady beetle, larvae of hoverfly, minute pirate bugs and damsel bugs and parasitic wasps, fungal diseases will also keep pea aphids populations in check.

Figure 7. Pea aphids tend to feed on the youngest leaf tissue. Unfold the clam leaf (newest stipule) to check for aphids. For more information regarding pea aphid life cycles and yield loss see Manitoba Agriculture's Pea Aphids on Peas, Faba beans and Lentils.

Preliminary Summary of Soybean Yield Loss from Hail at V2 to V3 in Manitoba

Kristen MacMillan, University of Manitoba

Soybean yield loss due to hail depends on the growth stage, type of damage and severity. Currently, we rely on soybean recovery data from the U.S. as there is no data available for Western Canada. However, research is underway to quantify the effect of stem breakage and defoliation on soybeans in Manitoba. The project was initiated in 2015 and is planned to be complete in 2019. To date, 3 out of 8 site-years have been lost due to actual hail.

Figure 8. Soybean re-growth on July 19, 2017 following stem breakage at V2. From L-R; control, 20%, 40%, 60%, 80% and 100% stem breakage/node loss.

Based on preliminary results from four site-years, if hail damage is limited to leaf defoliation at V2 to V3 (2nd to 3rd trifoliate), yield loss is likely minimal (e.g. Figure 9), although some yield loss has been detected at 100% defoliation (average of 15%). If main stem breakage occurs, yield loss can be high depending on the percentage of main stem nodes that are left. If only the cotyledons remain (100% stem breakage), re-growth can occur from the axillary buds (Figure 10, 11), but an average yield loss of 45% should be expected (Table 3). New growth at the axillary buds will be visible in a few days. If the cotyledons and unifoliate leaves remain (60-80% stem breakage), you can expect 18-25% yield loss (Table 3). Lastly, if only the first trifoliate or second trifoliate is broken (20-40% stem breakage), minimal yield loss is expected (Table 3). Growth will resume from the uppermost leaf node. If plants are cut below the cotyledons, re-growth is not possible and stand reduction has occurred. The yield loss data reported here is based on a full plant stand. It is important to acknowledge that hail damage is usually not this clear cut; typically, it is a combination of defoliation and stem breakage that occurs at a range of severity levels. The best you can do is survey the field and come up with a good average. In addition to yield loss, expect a delay in maturity if 100% defoliation or stem breakage occurs (up to 5 days).

Table 3. Soybean yield loss due to stem breakage/node loss at V2 in Manitoba (preliminary average from 4 site-years: Portage la Prairie and Minto, MB in 2015 and 2017).

% Main stem node loss	Remaining node(s)	Average % yield loss	% Range observed
20	Unifoliate, 1-2 trifolates	3	0 to 9
40		14	9 to 26
60	Unifoliate, some trifolate	18	13 to 22
80		25	16 to 44
100	Cotyledons	45	34 to 72

To assess hail damage:

1. Identify the growth stage prior to hail. Most soybeans in Manitoba were at V1 to V3 (1st to 3rd trifoliate), which corresponds to 2-4 nodes on the main stem (excluding the cotyledons). To identify the number of nodes on the main stem, add 1 to the V-stage, which counts trifoliate leaves.
2. Assess multiple plants in multiple areas of the field. For each plant, identify how much leaf defoliation or stem breakage occurred. Measure plant stand.
3. Identify the average % defoliation and/or % node loss and plant stand (# plants/ac) and apply yield loss data.

In other work, late seeded soybeans have been successful in the central region of Manitoba, maintaining about 80% yield potential through the 2nd week of June. Yield loss and maturity risk increased significantly through the 3rd week. In the shorter season area, late seeding was not successful beyond the 1st week of June due to late maturity and yield reduction.

Figure 9. Soybean defoliation at V2 on June 22, 2016 (top) and recovery on July 28, 2016 (bottom). The level of defoliation from L-R is 66%, 33% and 100%.

Figure 10. Only the cotyledons remain on these soybeans after 100% stem breakage/node loss occurred, but re-growth is expected.

Figure 11. Re-growth from the the cotyledon nodes (left) and unifoliate leaf nodes (right).