New Liskeard Agricultural Research Station

By Nathan Mountain, NLARS Cropping Systems Research Technician

The New Liskeard Agricultural Research Station conducted a range of locally-significant, yield-focused variety and management trials in 2018. For committee trial results (data), such as the Ontario Cereal Crops Committee (OCCC) and the Ontario Soybean and Canola committee (OSACC), please visit the *gocereals.ca* and *gosoy.ca* websites, respectively.

In 2018, the accumulated monthly rainfall was higher than the local 28-year average (data from 1990-2018, Figure 1) in May. A wet May was soon followed by markedly dry June (lowest amount of rainfall since 1990) and July (compared to the 28-year average), before returning to 'near-normal' monthly precipitation amounts. Lower than average rainfall events occurred throughout June and July (Figure 1) and temperatures were measured at near-average and above average values in July and August (Figure 2). As such, the dry conditions throughout June affected cultivar yields; weather summary for NLARS over the growing season can be seen in Figure 3. Please note that results shown, unless otherwise stated, are of one year's data under its respective growing conditions, and in most cases should be considered as preliminary results.

Although there were fewer observations of leaf diseases in cereals and soybeans, cereals in general were shorter and showed signs of stress (i.e. oat cultivars were found to have more thins than the previous year). Planting dates, soil and air temperatures, and precipitation in May are depicted in Figure 4. Early freeze-thaw periods in 2018 and pooling of surface water in the spring led to the cancellation of the Provincial Ontario Cereals Crop Committee (OCCC) Winter Wheat trial. Yield results for the provincial trials are shown for cereal performance/intensive (Area 5 means; Figure 5, A-C), as well as soybean performance trials (Figure 5, D and E). Fertilizer applications followed the OMAFRA guidelines, with the addition of 12 kg ha-1 actual ammonium sulphate for cereals. Additionally, fungicide application of Trivapro A & B (1 L ha-1 & 300 ml ha-1, respectively) was applied between plant growth stages 37 and 39 for oats, and spring wheat had a foliar application before growth stage 32, with a second application at flowering. The OCCC barley performance trial did not receive a fungicide application. Herbicide application at a rate of 1.25 L ha-1 of Logic M was applied to cereals on 15 June 2018. Control of weeds for the OSACC soybean trial used a tank mix of Assure II (0.63 L ha-1), Pinnacle SG (8.25 g ha-1), Basagran Forte (2.25 L ha-1), and Sure-Mix (5 L/1,000 L) tank mix (Actual).

Additional spring wheat trials in 2018 included an Agrotain® treatment trial with Koch Fertilizer Canada, ULC. The objective of this trial was to compare the use of nitrogen-stabilizing products to standard fertilization practices. With all plots within the trial receiving the same amount of Nitrogen fertilizer (70 kg ha-1 actual N) the total amount was split between first (before planting), second (Feekes stage 6), and third (flag leaf) passes. The treatment products and timings are depicted in Figure 6, alongside the trial yield results for 2018.

In 2018, Agriculture and Agrifood Canada (AAFC) funded a multi-year, multi-trial Oat Agronomy Study at a number of locations to determine production guidelines to improve oat yield and quality. The first trial is aimed at testing three oat cultivars for response to six N fertilizer treatments.

A brief summary of the oat agronomy study in 2018 from AAFC follows:

Nitrogen treatments were applied as preplant urea (46-0-0) at the following rates: 0, 40, 80, 120, 140, 180 and 200 kg ha-1. Three region appropriate cultivars were used at each site. In Eastern Canada: Nicolas, Akina and CS Camden, and in Western Canada: Summit, Souris and CS Camden. Soil test (0-15 cm) samples were taken through the fields prior to planting, and P and K fertilizers were added according to provincial guidelines at each site.

The following measurements and samples are taken: Soil samples (pre-plant, jointing, post-harvest), phenological stage notes, stand counts, Belgian lodging score, plant height, yield components, harvest index (HI), plot grain yield and moisture, test weight and seed quality determination (protein, oil, groat and beta-glucan). As analyses of 2018 samples are ongoing, this preliminary report focuses on yield and lodging data.

In general, sites experienced drier than usual early to mid-season, leading to decreased yields and increased variability. No lodging was observed at any of the study sites. Strong and statistically significant ($p<0.05$) N responses were observed at the Melfort and Beaverlodge sites, with weaker responses at the remaining sites. At the Ottawa site, few N treatments were statistically different due to variability, yet in two (Akina and CS Camden) of the three cultivars, treatment averages responded to increasing N in the lower rates. There was a lack of responses of cultivar yields to N treatments, likely due to legume (clover) as the preceding crop at Normandin and small plot size (and likely erratic rainfall) at New Liskeard sites. No statistically significant cultivar by N treatments interactions were observed. In general, the most effective rate of nitrogen in terms of yield appeared to be in the 80 - 120 kg ha-1 range, based on the Ottawa, Melfort and Beaverlodge sites. In following years, the maximum economic rate of nitrogen (MERN) will be determined.

In addition, AAFC also funded a multi-year and multi-location initiated by Dr Raja Khanal to evaluate hull and hulless barley seeding rates. Hulless barley has been shown to deliver higher quality feed for livestock than traditional barley; however, the nature of an exposed germ may result in problems with germination and emergence. The goal of this trial was to refine and develop both hulled and hulless barley seeding rate recommendations, in an effort to optimize grain yield. Mean grain yields for three hulled cultivars (1 six row, and 2 two row cultivars) and three hulless cultivars (1 six row, and 2 two row cultivars) can be see in Figure 7(A) and grain yields with the highest means for hull and hulless cultivars (Figures 7B and 7C, respectively).

NLARS also participated with AAFC in a project "*Identification and characterization of virus-like diseases in oat crop using next generation sequencing (NGS) technology*" in 2018. The project was initiated by Dr. Yu Xiang of the Summerland Research and Development Centre (RDC), BC, and partners with oat breeders conducting trials at Brandon RDC, Lacombe RDC, Ottawa RDC, Quebec RDC, and NLARS. This project is a start (pilot project) to a metagenomics survey of oat viral diseases across Canada; with success, the project may be expanded to encompass cereal viral diseases as well.

In summer 2018, a total of 51 samples were collected at multiple sites, including Beaverlodge, AB, Brandon, MB, New Liskeard, ON, and Normandin, QC. Twenty tissue samples were collected from a variety of oat cultivars at NLARS and sent to Summerland RDC for analysis. Of the samples collected in NLARS, one sample came back positive with barley yellow dwarf virus (BYDV). At the nucleotide level, sequencing of the sample was 98% similar to one of the sequences found in Brandon, MB (Brandon had 3 BYDV genome sequences identified). Virus infection, such as BYDV, cereal yellow dwarf virus (CYVD), and wheat streak mosaic virus (WSMV) in oats decrease yield and causes shrivelled grains. These viruses persist from

one growing season to the next in grasses and are transmitted by aphids. NGS technologies provides a new metagenomics approach for repaid diagnosis of plant viral diseases by direct detection of all or specific virus populations in a particular ecosystem without the requirement of prior knowledge of the virus/viruses in question. Of special note, the agronomy department staff at NLARS has been specially invited to contribute to the final 2018 results research report.

Although the aforementioned trials are not an exhaustive listing of all trials performed at NLARS, during the 2018 growing season, the highlighted trials provide a good example of some of the important crops research ongoing in our local region. With Joshua Nasielski joining the faculty of the Department of Plant Agriculture at the University of Guelph, in the MacSon Professorship for Northern and Eastern Ontario Agronomy, local growers can look forward to benefitting from Professor Nasielski's expertise and contributions to crops research at NLARS.

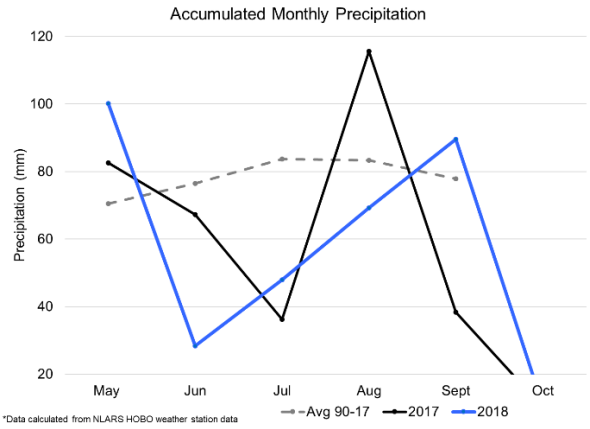

Figure 1: Accumulated monthly rainfall at NLARS.

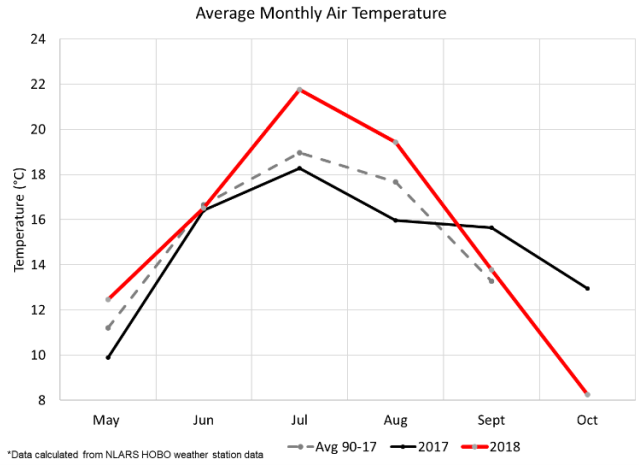

Figure 2: Average monthly air temperature at NLARS.

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Weather Records for NLARS

Summary 2018

Month	Air Temperature			Precip (mm)	Growing Degree Days	Corn Heat Units (CHU)	Days with Precip.
	Avg °C	Min °C	Max °C				
May	12.5	-4.2	32	100.2	**155**	**248**	11
June	16.5	0.8	33	28.4	327	529	10
July	21.8	3.3	36	48.0	518	763	12
August	19.3	3.4	33	69.4	445	701	11
September	13.8	-0.4	30	89.6	266	446	10
October (Until **Oct 4** - First Frost)	8.2	-2.6	20	10.8	13	14	3
Total				**346**	**1723**	**2703**	

Note: Blue text calc. from last frost

Figure 3: 2018 weather summary at NLARS.

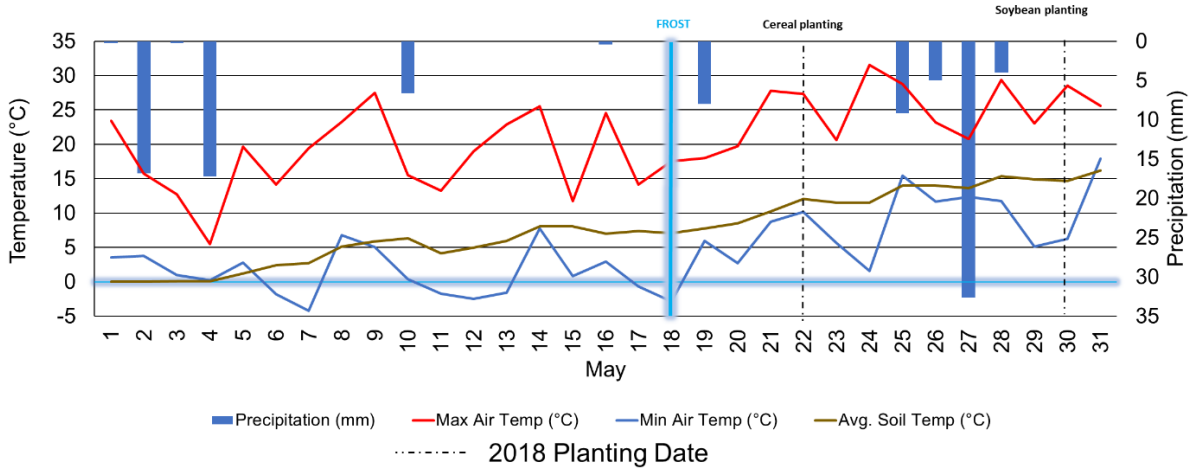
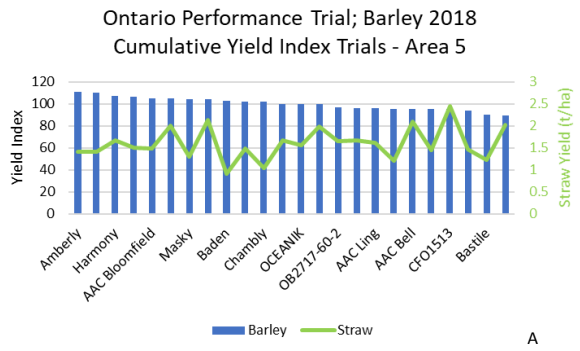
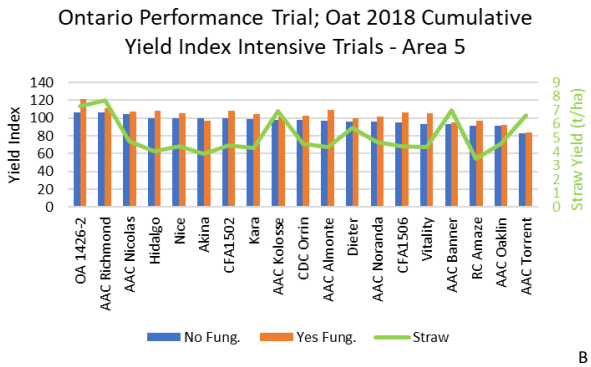


Figure 4: NLARS' May planting dates, soil and air temperatures, and precipitation.



A



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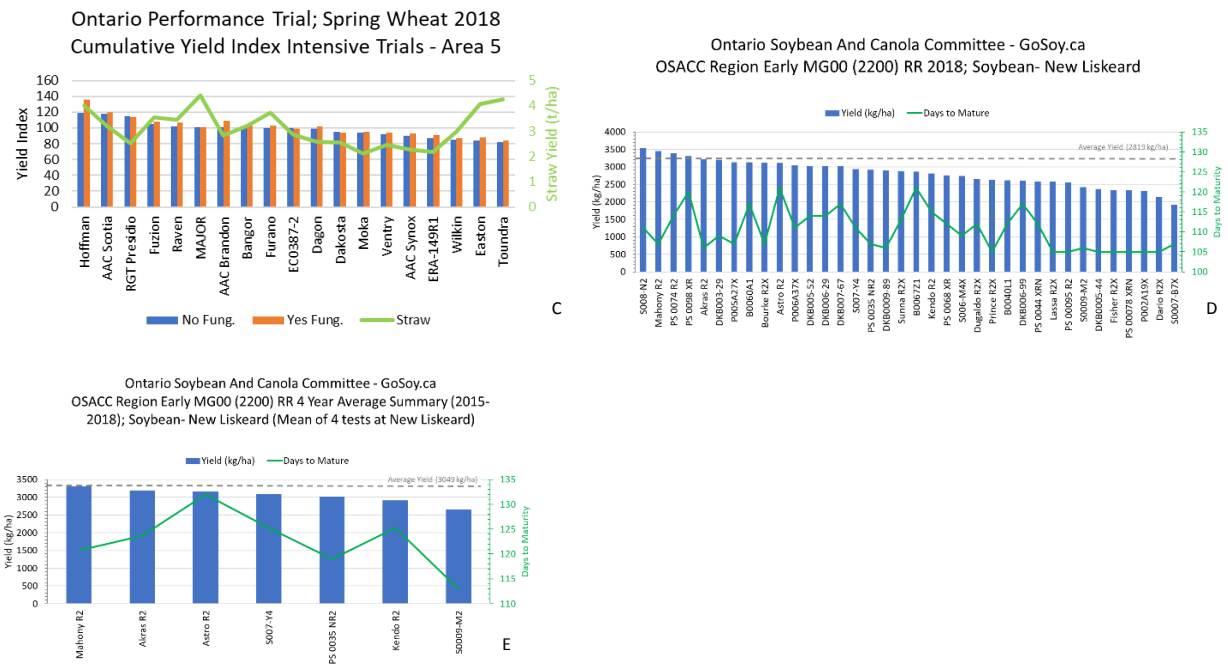

Figure 5: Graphs A-C depict results from OCCC cereal trials for Barley (A), Oats (B), Spring Wheat (C), and OSACC soybean results for 2018 (D) and the 4 Year Average Summary (E).

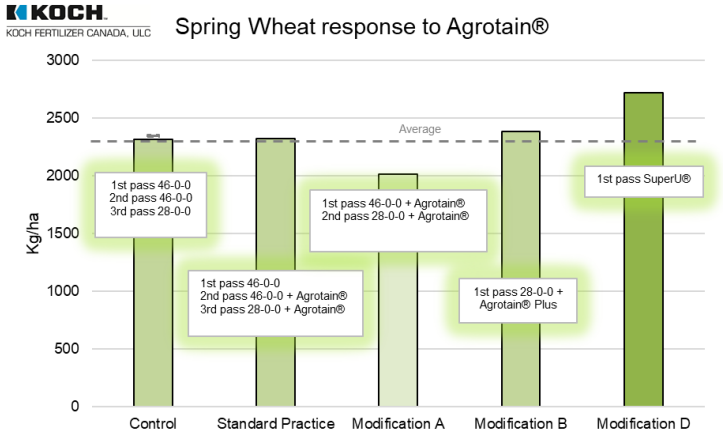

Figure 6: Spring wheat response to nitrogen stabilizing products and practices; 1st pass = before planting, 2nd pass = Feekes stage 6, 3rd pass = Flag leaf. All treatments received a total of 70 kg/ha actual N fertilizer.

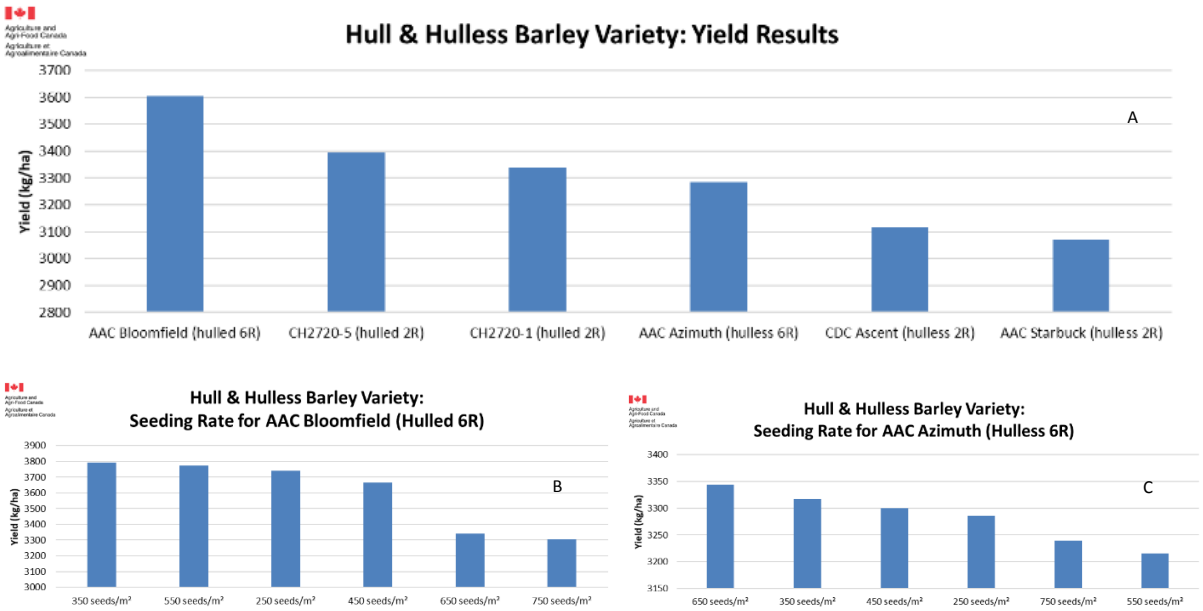

Figure 7: A) Mean of all seeding rates per variety, B) Mean yields for each of AAC Bloomfield seeding rates, C) Mean yields for each of AAC Azimuth seeding rates; All seeding rates had 4 replications.