2. Summary of Research Results 2025

The weather was dry early (rainfall in May only 19.5 mm) and late in the season (rainfall in August only 12.6 mm). But for that, crop yields would have been better this year. Total rainfall (304.5 mm) during the season (May to September) this year was a bit better than the last year (279.7 mm). GDD and CHU during May to September were 1,687 and 2,794, respectively – higher than that during the last year (1,589 and 2,642, respectively). The crop yields could be better if the weather was a bit less hot this year. However, it may be good to note from the weather tables that the seasonal rainfall has been on the increase since 2023.

2.1 Screening of crop varieties:

2.1.1 Spring Cereals:

√*Barley Varieties:*

- Thirteen barley varieties (six new this year!) were compared for their production potential.
- *CDC Bow* had the highest grain yield (4.77 MT/ha); 0.63 MT/ha higher than *Synasolis* (4.14 MT/ha). Three other good grain yielding varieties were *PSL Kerns* (4.40 MT/ha), *Boroe* (4.33 MT/ha) and *AAC Stockton* (a new variety this year; 4.32 MT/ha).
- *AAC Beckett (a new hulless variety)* gave the highest straw yield (9.92 MT/ha), followed by *AAC Stockton* (9.04 MT/ha), *Synasolis* (8.71 MT/ha) and *PSL Kerns* (8.69 MT/ha).
- Adjusted for hulls, *AAC Beckett* would have the highest grain yield!
- Biomass yields were the highest with *AAC Beckett* (13.5 MT/ha), *AAC Stockton/CDC Bow* (13.4 MT/ha) and *AAC Crankbrook* (13.3 MT/ha).
- Diseases pressure was either moderate (BYDV or Spot Blotch) or negligible (FHB).
- Lodging Index ranged from 5.3 (*AAC Stockton/ PSL Kerns*) to 7.0 (*Esma*). Lodging Index in *CDC Bow* and *Synasolis* was 5.5 and 6.8, respectively. *This means that Esma and Synasolis were more prone to lodging than the other varieties.*
- Averaged over 2023-2025, out of six varieties, three high grain yielding varieties were *AAC Crankbrook* (4.84 MT/ha), *PSL Kerns* (4.69 MT/ha) and *CDC Bow* (4.68 MT/ha)
- *Barley producers may wish to add AAC Stockton to their barley portfolio!*

√*Malting Barley Varieties:*

- Nine varieties were evaluated for grain and straw production.
- *AAC Synergy* gave the highest grain yield (5.26 MT/ha), followed by *CDC Bow* (4.68 MT/ha) and *UC Capay* (4.66 MT/ha). But for lodging, grain yields would have been better.
- *UC Capay* produced the highest straw (10.55 MT/ha) and biomass (15.2 MT/ha) yields. Next best varieties in straw and biomass production were *CDC Copper* (straw 10.51 MT/ha and biomass 14.9 MT/ha) and *CDC Bow* (straw 9.90 MT/ha and biomass 14.6 MT/ha).
- Averaged over 2024-2025, *UC Tahoe* recorded the highest grain yield (5.10 MT/ha), and *UC Capay* the highest straw (8.74 MT/ha) and biomass yields (13.6 MT/ha). Straw and biomass yields from *AAC Synergy* were 7.51 MT/ha and 12.4 MT/ha, respectively.
- Averaged over 2021-2025, *CDC Bow* (4.95 MT/ha), *AAC Synergy* (4.91 MT/ha) and *CDC Copper* (4.67 MT/ha) gave statistically the same yield.
- *Since the Californian varieties (UC Capay and UC Tahoe) and CDC Bow seeds aren't available in Canada, farmers could continue growing AAC Synergy on their farms.*

√*New Canadian Western Red Spring (CWRS) Wheat Varieties:*

- Nine CWRS wheat varieties (three new this year!) were evaluated for their production potential.
- Three highest grain yielding varieties were *Brandon* (4.50 MT/ha), *AAC Westking* (4.44 MT/ha) and *AAC Wheatland VB* (4.34 MT/ha).
- *AAC Hassler* produced the highest straw (10.14 MT/ha) and biomass (14.5 MT/ha) yields. Its grain yield was 4.28 MT/ha. *AAC Westking* had the second highest straw (9.45 MT/ha) and biomass (13.9 MT/ha) yields.

- Diseases (BYDV, Septoria, Spot Blotch, Loose Smut and FHB) pressure and Lodging Index were negligible!
- Averaged over 2024-2025, *Brandon* and *AAC Westking* equaled in grain yield (4.91 MT/ha). However, straw yield was higher with *AAC Westking* (8.92 MT/ha) than with *Brandon* (8.51 MT/ha). Biomass yield was almost equal (13.4-13.8 MT/ha) in the two varieties.
- Averaged over 2023-2025, *Brandon* and *AAC Wheatland VB* equaled in grain yield (4.22 MT/ha) and more or less equaled in straw and biomass yields.
- *Area producers could try growing AAC Westking for good grain and straw yield. However, AAC Hassler could be a choice, if more straw is required.*

√*Oat Varieties:*

- Six oat varieties were evaluated for their yield potential. *CDC Endure*, which has good milling qualities and high beta glucan levels that end users require to make heart healthy products like breakfast cereals, was one of these varieties. *AAC Fedak* was a new variety this year.
- Grain yield of oats, this year, was better than those of wheat and barley and ranged from 5.96 MT/ha with *Akina* to 7.80 MT/ha with *AAC Reid*, which gave a MT/ha higher grain yield than *AAC Fedak* and *AAC Excellence*.
- Highest straw (9.07 MT/ha) and biomass (15.7 MT/ha) yields were obtained with *AAC Fedak*.
- Averaged over 2023-2025, *AAC Kongsore* gave the highest grain yield (6.54 MT/ha) and *AAC Reid* the highest straw (6.59 MT/ha) and biomass (12.5 MT/ha) yields.
- *Oat growers could try growing AAC Kongsore* and *AAC Reid; the latter one, apart from good grain yield, will give you good straw yield too!*

2.1.2 Winter Cereals:

√*Winter Wheat Varieties:*

- Ten winter wheat varieties were compared for their production potential, including relatively two new varieties *AAC Overdrive* and *AAC Network*.
- *AAC Overdrive*, produced the highest grain yield (6.75 MT/ha). The next two best varieties for grain yield were *CDC Falcon*, an oldest variety (6.04 MT/ha) and *AAC Coldfront* (5.79 MT/ha).
- Straw yield was highest with *AAC Overdrive* (10.5 MT/ha); followed by *AAC Coldfront* (9.97 MT/ha) and *CDC Falcon* (9.27 MT/ha).
- Plant height didn't increase more than 71 cm in any of the varieties.
- Averaged over 2024 and 2025, grain yields were in the order of *CDC Falcon* (6.14 MT/ha) ≥ *AAC Overdrive* (5.98 MT/ha) ≥ *AAC Coldfront* (5.75 MT/ha). Straw yields were highest with *CDC Falcon*/*AAC Coldfront* (9.69 MT/ha) and *AAC Overdrive* (9.56 MT/ha).
- *Farmers could try growing AAC Overdrive in 2025-'26.*

√*Winter Barley Varieties:*

- Five winter barley varieties (*McGregor*, *McKeller*, *Scala, LCS Calypso and SU Ruzena*) were tested for their winter survival and yield.
- Unfortunately, none of the varieties survived 2024-2025 winter.

√*Winter Rye Varieties:*

- Five winter rye varieties were compared for their production potential, including a relatively new variety *KWS Serafino*.
- There was no significant effect of varieties on the grain yield, which ranged from 5.88 MT/ha with *Hazlet* to 6.14 MT/ha with *KWS Serafino*.
- Straw yield was the highest (10.5 MT/ha) with *Hazlet* and the lowest (8.46 MT/ha) with *KWS Serafino*.
- Biomass yield was highest (16.7 MT/ha) with *Hazlet* and lowest (14.1 MT/ha) with *Brasetto*.
- *Hazlet* produced the tallest (148 cm) and *Bono*/and *KWS Serafino* the shortest plants (129 cm).
- Averaged over 2023-2025, *KWS Serafino* produced the highest grain yield (7.54 MT/ha; 0.45 MT/ha higher than *Hazlet*) and *Hazlet* the highest straw (10.61 MT/ha; 1.66 MT/ha higher than *KWS Serafino*) and biomass (17.5 MT/ha) yields.

- *If you need higher grain yield, grow KWS Serafino and if you are looking for higher straw yield, then grow Hazlet!*

2.1.3 Grain Legumes and Oil Seeds Varieties:

√*Soybean Varieties (Seeded on May 28, 2024):*

- Sixteen varieties were compared for their grain production potential.
- Three top grain yielding varieties were *S007-C2E3* (3.25 MT/ha), *Badger R2X* (3.03 MT/ha) and *EXP008-23XF* (2.93 MT/ha).
- *Badger R2X* gave the highest straw (5.97 MT/ha) and biomass (9.01 MT/ha) yields, closely followed by *S007-C2E3* (straw 5.36 MT/ha and biomass 8.61 MT/ha).
- Averaged over 2022, 2024 and 2025, *Badger R2X* recorded the highest grain (2.04 MT/ha), straw (3.05 MT/ha) and biomass (5.09 MT/ha) yields
- *S007-C2E3* and *Badger R2X could be recommended for cultivation on farms!*

√*Winter Canola Varieties:*

- Two winter canola varieties, *Mercedes* and *Inspiration*, were tested for their winter survival and production potential.
- Neither *Mercedes* nor *Inspiration* survived 2024-2025 winter.

√*Liberty Canola Varieties (Seeded on May 10, 2024):*

- Twelve varieties were evaluated; some of them new and more than half of which had Clubroot resistance, and at least half of them had shatter reduction trait. *P stands for 'Shatter Reduction' and C for 'Clubroot Resistance'.*
- Three top seed yielding varieties were *InVigor® L330PC* (6.00 MT/ha), *Invigor® L343PC* (5.78 MT/ha) and *DK401 TL* (5.73 MT/ha).
- Three-four top straw yielding varieties were *Invigor® L333PC* (14.6 MT/ha), *Invigor® L350PC* (13.2 MT/ha), and *InVigor® L340PC* (12.8 MT/ha)/*InVigor® L330PC* (12.3 MT/ha).
- Biomass yield was highest with *InVigor® L333PC* (20.3 MT/ha), followed by *InVigor® L350PC* (18.5 MT/ha) and *InVigor® L330PC* (18.3 MT/ha).
- Averaged over 2022-2023, seed yields were in the order of *P501L* (4.09 MT/ha) ≥ *DKLL-82SC* (3.84 MT/ha).
- *Area growers could try cultivating InVigor® L330PC* and *InVigor® L343PC on their farms in 2025, especially if high straw yield is also a consideration!*

√*Roundup Ready Canola Varieties (Seeded on May 15, 2025):*

- Nine varieties were compared for their production potential. *CR stands for Clubroot resistance, TF for Truflex and TL stands for double trait; Trueflex and Liberty.*
- *DK903TF* gave the highest seed yield (7.19 MT/ha). The next two best varieties in seed yield were *DK901TF* (6.62 MT/ha) and *DK900TF* (6.12 MT/ha).
- BrettYoung and Canterra Seeds varieties gave higher straw yield (12.2-12.9 MT/ha) than DeKalb varieties; though *DK903TF* (11.5 straw MT/ha) didn't give significantly lower straw yield than BrettYoung and Canterra Seeds varieties.
- There were no differences in plant height (134-138 cm) among different varieties.
- Averaged over 2024-2025, *DK903TF* gave the highest seed yield (6.25 MT/ha), followed by *DK901TF* (5.75 MT/ha) and *DK900TF* (5.75 MT/ha).
- *Farmers, if they decide to grow RR canola, could prefer DK903TF for cultivation on their farms.*

√*Clearfield Canola Varieties (Seeded on June 13, 2022):*

- Four varieties were compared for their production potential.
- Highest seed (4.74 MT/ha), straw (12.2 MT/ha) and biomass (17.0 MT/ha) yields were obtained with *5545CL*.
- Averaged over 2023-2025 too, Highest seed (4.81 MT/ha), straw (8.92 MT/ha) and biomass (13.2 MT/ha) yields were obtained with *5545CL*.

2.1.4 Forage Crops/Varieties:

√*Spring Barley Varieties for Forage Production:*

- Thirteen varieties were evaluated for forage production.
- Three highest forage dry matter yielding varieties were *AAC Lariat* (14.7 MT/ha; 10.3 % protein), *Synasolis* (14.7 MT/ha; 14.6 % protein) and *CDC Bow* (14.3 MT/ha; 15.2 % protein). RFV in these three varieties was above 110. *AB Standwell* had the highest protein content (16.5 %; dry matter yield 12.2 MT/ha).
- Dry matter yield in other varieties ranged from 9.3 MT/ha in *PSL Kerns* to 12. 2 MT/ha in AB Standwell.
- RFV was the highest (149) in *AAC Magenta*.
- *Considering the dry matter yield, and protein content CDC Bow* and *Synasolis could be recommended for forage production!*

√*Malting Barley Varieties for Forage Production:*

- Nine varieties were evaluated for forage production.
- Highest forage dry matter yield (15.3 MT/ha) was obtained with *CDC Bow.* Two next best varieties for forage production were *CDC Copper* (13.8 MT/ha) and *UC Tahoe* (13.6 MT/ha).
- Averaged over 2024-2025, *CDC Bow* (16.2 MT/ha), UC Tahoe (15.7 MT/ha) and *CDC Copper* (14.8 MT/ha) produced the highest forage dry matter yields.
- Protein content was better in *UC Tahoe* (14.1 %), *Butta 12* (13.8 %) and *CDC Bow* (13.3 %) than the other varieties (9.8 % in *KWS Kellie* to 12.8 % in *AB Dram*).
- *BC 100* had the highest RFV (147). RFV in *CDC Bow*/AAC Synergy, *UC Tahoe* and *CDC Copper* were 118, 116 and 113, respectively.
- Averaged over 2024 and 2025, protein content was highest in *Butta* 12 (13.3 %), followed by *AB Dram* (12.3 %) and *CDC Copper* (11.4 %). Protein content in *CDC Bow* was 10.8 %.
- Averaged over 2024 and 2025, *AAC Synergy*/*BC 100* (130), *AB Dram* (124), *UC Capay* (122) and *CDC Copper* (121) had higher RFV than the other varieties (98 in *KWS Kellie* to 111 in *CDC Bow*).
- *Considering the dry matter yield over years, CDC Bow* and *CDC Copper can be recommended for forage production! CDC Copper is a dual-purpose variety (grain and forage production) and its seed can be procured from FP Genetics.*

√*Comparative Performance of Alfalfa and Galega (Seeded in 2011): Two cuts were taken!*

- Averaged over 2012-2025, *Galega* gave 1,307 kg/ha higher dry matter yield than *alfalfa*, which was more grass than alfalfa. Alfalfa stand had become scanty over the years. In fact, there was hardly any alfalfa in alfalfa plots this year. Therefore, no harvest was taken from there.
- Protein content in *Galega* was about 19.5 % in the first as well as in the second cut.
- RFV in *Galega* was 107-120 in the first cut, and 105-115 in the second cut.
- *Higher yield and better persistence in Galega than in alfalfa, could make Galega a better fodder choice than alfalfa!*

√*Corn Silage Varieties:*

- Eleven silage corn varieties were evaluated for their forage production potential.
- *ENOGEN*/*E44H12* (27.1 MT/ha), *DKC21-36RIB* (26.1 MT/ha) and *DKC30-07RIB* (25.0 MT/ha) recorded higher dry matter yield than the other varieties (15.3 – 24.0 MT/ha).
- Among the varieties that were common during 2023 to 2025, averaged over these years, highest yields were obtained with *MS 8022R*, *DKC29-89RIB* and *DKC30-07RIB* (18.4-18.6 MT/ha).
- *ENOGEN*, *E44H12*, *DKC21-36RIB and DKC30-07RIB could be recommended for cultivation on farms! DKC30-07RIB has consistently given higher yield over the years (2023-2025)!*

√*Sorghum Sudangrass Varieties:*

- One *Pearl millet* variety and seven *Sorghum Sudangrass* varieties were tested for their production potential.

- *CSSH 45* registered the highest dry matter yield (9.08 MT/ha) followed by 8.20 MT/ha by *CFPM 101 (Pearl millet)* and 8.18 MT/ha by *Pacific Grage Brand Hybrid*. Dry matter yield with *BMR* was low at 6.51 MT/ha.
- In the first cut, *BMR* recorded the highest protein content (20.1 %) followed by *Pacific Grage Brand Hybrid* (19.6 %) and *CFSH 30* (19.4 %). *CSSH 45* had the lowest (13.7 %) protein content. RFV was the highest (133) in *BMR*, followed by *CFSH 30* (121) and *Pacific Grage Brand Hybrid* (120).
- Averaged over the three years (2023 - 2025) *Pacific Grage Brand Hybrid* produced the highest dry matter yield (8.18 MT/ha).
- *CSSH 45*, *CFPM 101 (Pearl millet)* and *Pacific Grage Brand Hybrid can be recommended for cultivation on farms!*

√*Evaluation of Combined Cultivation of Sorghum Sudangrass and Alfalfa (Seeded in 2023):* Two cuts were taken.

- Maximum dry matter yield from the two cuts (6,183 kg/ha) was obtained with alfalfa @ 100 % seed rate without sorghum Sudangrass closely followed by sorghum Sudangrass @ 100 % seeding rates + alfalfa @ 125 % seeding rates (5,942 kg/ha). In both the treatments, one cut was taken in the seeding year.
- Protein content in the first cut ranged from 12.9 % in sorghum Sudangrass @ 100 % seeding rate + alfalfa @ 125 % seeding rate with one cut taken in the seeding year to 15.3 % with alfalfa alone @ 125 % seeding rate with one cut taken in the seeding year.
- Sorghum Sudangrass @ 75 % seeding rates + alfalfa @ 125 % seeding rates with two cuts in the seeding year had 15.2 % protein in the first cut. The treatments that resulted in 15 % protein content in the first cut were alfalfa alone seeded at 100 % and 125 % seeding rates with no cut in the seeding year and Sudangrass @ 50 % seeding rate + alfalfa @ 100 % seeding rate with two cuts in the seeding year.
- Protein content in the second cut ranged from 15.2 % with Sudangrass + alfalfa both seeded @ 100 % seeding rates with two cuts in the seeding year to 19.1 % with Sudangrass @ 50 % seeding rates + alfalfa @ 125 % seeding rates with one cut in the seeding year. Alfalfa alone @ 100 seeding rate without any cut in the seeding year had 18.8 % protein.
- Averaged over 2023-'25, maximum dry matter yield from the two cuts (5,700 kg/ha) was obtained with alfalfa @ 100 % seed rate without sorghum Sudangrass closely followed by sorghum Sudangrass @ 75 % seeding rates + alfalfa @ 100 % seeding rates (5,337 kg/ha). In both the treatments, one cut was taken in the seeding year. Dry matter yield with sorghum Sudangrass @ 50 % seeding rates + alfalfa @ 100 % seeding rates with two cuts in the seeding year was 5,332 kg/ha.

√*Evaluation of Combined Cultivation of Sorghum Sudangrass and Alfalfa (2024 Seeded):*

- Maximum dry matter yield from the two cuts (5,007 kg/ha) was obtained with alfalfa alone @ 125 % seeding rate when one cut was taken in the seeding year. Second best treatments in dry matter yield were alfalfa alone @ 100 % seeding rate with one cut taken in the seeding year (4,785 kg/ha) and sorghum Sudangrass seeded @ 75 % seeding rate + alfalfa seeded @ 125 % seeding rate (4,708 kg/ha) with one cut taken in the seeding year.
- Highest protein content (21.1 %) in the first cut was recorded with sorghum Sudangrass seeded @ 100 % seeding rate + alfalfa seeded @ 125 % seeding rate with one cut in the seeding year. Generally speaking, sorghum Sudangrass and alfalfa mixtures with one or two cuts in the seeding year gave higher or equal protein content to alfalfa alone treatments.
- In the second cut, alfalfa @ 100 % seeding rate with one cut in the seeding year had the highest protein content (23.8 %). In other treatments, protein content ranged between 19.2 % in sorghum Sudangrass seeded @ 100% seeding rate + alfalfa seeded @ 125% seeding rate, with two cuts in the seeding year to 22.9 % with sorghum Sudangrass + alfalfa both seeded @ 100 % seeding rates when one cut was taken in the seeding year.

- Averaged over 2024 and 2025, Alfalfa @ 100 % seeding rate without any cut in the seeding year gave the highest dry matter yield (4,120 kg/ha).

√*Evaluation of Combined Cultivation of Sorghum Sudangrass and Alfalfa (2025 Seeded):*

- Maximum dry matter yield (3,774 kg/ha) was obtained with two cuts from sorghum Sudangrass seeded @ 75 % seeding rate + alfalfa seeded @ 100 % seeding rate. The second best treatment was sorghum Sudangrass seeded @ 50 % seeding rate + alfalfa seeded @ 125 % seeding rate that gave 3,218 kg/ha dry matter yield. Relatively low yield in the seeding year is not unusual.
- Sorghum Sudangrass seeded @ 100 % seeding rate + alfalfa seeded @ 125 % seeding rate had the highest protein content (23.2 %), followed by 22.7 % in sorghum Sudangrass seeded @ 100 % seeding rate + alfalfa seeded @ 100 % seeding rate and 22.6 % with alfalfa alone @ 125 % seeding rates.
- In the second cut, maximum protein content (18.4 %) was recorded in sorghum Sudangrass seeded @ 50 % seeding rate + alfalfa seeded @ 125 % seeding rate.

√*Sorghum Sudangrass Seeding Rate Effects on Alfalfa and Canola as Subsequent Crops:*

- This year, *Corn* and *Barley* at recommended seed rates were compared with *Sorghum Sudangrass* @ 45, 70, 80 and 90 kg/ha seeding rates for forage production. Effect of these crops on canola and alfalfa will be studied next year!
- Forage dry matter yield was in the order of *Corn* (9.25 MT/ha) > *Barley* (8.84 MT/ha) > *Sorghum Sudangrass* @ 90 kg seed/ha (8.43 MT/ha). All other seeding rates of *Sorghum Sudangrass* produced lower dry matter yield than *Sorghum Sudangrass* seeded @ 90 kg seed/ha.
- *Sorghum Sudangrass* @ 45 kg seed/ha that had the highest protein content last year, had the lowest protein content (16.8 %) this year. Protein content in *Barley*, *Corn* and *Sorghum Sudangrass* @ 70, 80 and 90 kg/ha was more or less the same (17.4-17.8 %).

√*Sorghum Sudangrass Seeding Rate (Seeded in 2024) Effects on Alfalfa and Canola as Subsequent Crops in 2025:*

- *Corn* and *Barley* at recommended seed rates were compared with *Sorghum Sudangrass* @ 45, 70, 80 and 90 kg/ha seeding rates for forage production last year. Effect of these crops on canola and alfalfa was studied this year!
- Maximum canola seed yield was recorded after *Sorghum Sudangrass* seeded @ 45 kg seed rate/ha though maximum straw yield (8.66 Mt/ha) was obtained after *Barley*. Biomass yield after *Barley* (12.8 MT/ha) and *Sorghum Sudangrass* seeded @ 45 kg seed rate/ha (12.5 MT/ha) was similar.
- Alfalfa yield was poor, probably because of shading effect of canola and was maximum (1,051 kg/ha) after *Sorghum Sudangrass* seeded @ 90 kg seed rate/ha.
- Protein content in the first cut alfalfa ranged from 17.8 % after *Sorghum Sudangrass* seeded @ 70 kg seed rate/ha to 20.9 % after *Barley*.
- Weeds count taken in 2025 revealed that *Canada Thistle* and *Dandelions* were the predominant weeds. *Canada Thistle* count/m^2 was in the order of 37.5 after *Corn* > 22.3 after *Barley* > 17.0 after *Sorghum Sudangrass*.
- *Dandelions* count/m^2 was in the order of 19.0 after *Sorghum Sudangrass* > 11.1 after *Barley* > 9.71 after *Corn*.
- *Canada Thistle* count/m^2 was higher in Canola (26.4) than in Alfalfa (16.2), whereas reverse was true for *Dandelions* – 15.3 in *Alfalfa* and 10.7 in *Canola*.
- See the main report for the count of other weeds; Hairy Wetch, Lambs Quarters, Plantain, Shepherd's Purse and Old Witchgrass.

2.2 Fertilizer Management Practices and Growth Regulators/Biostimulants (Grain/Seed crops):

2.2.1 Spring Cereals:

√*Comparative Performance of Manipulator and Moddus at Two Rates of Nitrogen (80 and 160 kg N/ha) in Spring Wheat (Brandon) and Spring Barley (Boroe):*

- Pre-Seeding Soil Test was: Nitrate N: 14 ppm, and Ammoniacal N: 8 ppm.
- Maximum grain yield in wheat (3.89 MT/ha) was recorded with 80 kg N/ha, but without *Moddus*/or *Manipulator* spray, whereas maximum grain yield in barley (5.05 MT/ha) was obtained with 160 kg N/ha and without *Moddus*/or *Manipulator*. Grain yield of barley (5.00 MT/ha) at 160 kg N/ha with *Moddus* was equal to, but not better than, 160 kg N/ha without *Moddus*/or *Manipulator*.
- Maximum straw yield (7.04 MT/ha) was obtained with wheat applied with 160 kg N/ha and *Moddus*.
- Maximum biomass yield (11.6/11.5 MT/ha) was registered by barley at 160 kg N/ha without plant growth regulators/and by wheat at 160 kg N/ha sprayed with *Moddus*.
- Averaged over N rates and *Manipulator*/*Modus* treatments, barley outyielded wheat by 0.74 MT/ha in grains and 0.3 MT/ha in biomass yield.
- Averaged over crops and *Manipulator*/*Modus* treatments, grain (4.42 MT/ha), straw (6.08 MT/ha) and biomass (10.5 MT/ha) yields were highest with 160 kg N/ha.
- Averaged over crops and N rates, *Modus*, not *Manipulator*, improved grain, straw and biomass yields by 0.29 MT/ha, 0.48 MT/ha and 0.80 MT/ha, respectively.
- Averaged over years (2021-2025), N rates and *Manipulator*/*Modus* treatments, barley produced significantly higher grain and biomass yields than wheat. Straw yield of barley was only marginally higher than that of wheat.
- Averaged over years (2021-2025), crops and *Manipulator*/*Modus* treatments, application of N significantly increased the grain, straw and biomass yields. However, there was no difference between the grain, straw and biomass yields at the two rates of N (80 and 160 kg N/ha).
- Averaged over years (2021-2025), crops and N rates, *Modus,* not *Manipulator*, spray seemed to increase the grain yield, but not the straw and biomass yields. Surprisingly, the two PGRs didn't lower the plant height as compared to the check (no PGR spray).
- *Farmers may prefer Moddus over Manipulator to minimize lodging in the cereals!*

√*Residual Effect of MAP + MST Applied to Canola (2024) on Spring Wheat (2025):*

- Grain yield wasn't significantly affected by the treatments, though the highest grain (4.55 MT/ha) and biomass (12.2 MT/ha) yields were obtained with S @ 36 kg S/ha, 24 kg S/ha from ammonium sulphate and 12 kg S/ha from MAP + MST.
- Straw yield was highest (7.76 MT/ha) with 36 kg S/ha; half applied from ammonium sulphate and half from MAP + MST.
- Averaged over S sources, application of S @ 36 kg S/ha in 2024 did not improve the grain yield, but significantly improved the straw yield by 1.28 MT/ha, and biomass yield by 1.4 MT/ha, as compared to no S application.
- Among the sources/and blends of S sources, grain yield wasn't significantly improved by S sources/or their blends. However, straw (7.48 MT/ha) and biomass (11.8 MT/ha) yields were the highest with a blend of ammonium sulphate and MAP + MST.
- Averaged over 2023-2025, highest grain (4.66 MT/ha), straw (6.64 MT/ha) and biomass (11.1 MT/ha) yields were recorded with the application of 36 kg S/ha (last year); 24 kg S/ha from ammonium sulphate and 12 kg S/ha from MAP + MST, though the yields differences among the treatments weren't significant.

√*Evaluation of TAPP 3 for Spring Wheat Production:*

- *TAPP 3* is a phosphorus fertilizer that contains 25 % P_2O_5, 8% K_2O, 7.5 % S, 12.5 % Ca and 1.6 % Mg. *TAPP* was compared with *MAP* @ 25, 37.5 and 50 kg P_2O_5/ha. K, S, and B were kept equal in all the treatments. Pre seeding P test was 10 ppm.
- Grain yield wasn't significantly affected by sources or rates of phosphorus application and ranged from 4.83 MT/ha (25 kg P_2O_5/ha from *TAPP*) to 5.30 MT/ha (37.5 kg P_2O_5/ha from *MAP*).
- The treatments had significant effect on straw and biomass yields and the highest straw (9.32 MT/ha) and biomass (14.3 MT/ha) yields were obtained with *MAP* @ 50 kg P_2O_5/ha. None of the

other treatments gave higher straw or biomass yield than the check (No P_2O_5) treatment that produced 7.53 MT/ha straw and 12.5 MT/ha biomass.

- Averaged over P sources, grain yield in check was 4.99 MT/ha and that with 50 kg P_2O_5/ha was 5.08 MT/ha; practically no difference in the grain yield with application of P!

√*Effect of Different Rates of Phosphorus on Barley:* Application of phosphorus on soil test basis was compared with 1.5 and 2 times rates based on soil test basis. Pre seeding P test was 10 ppm.

- Highest grain yield (6.15 MT/ha) was obtained with application of *Phosphorus* at 2 times rate based on the soil test, whereas highest straw (9.45 MT/ha) and biomass (15.0 MT/ha) yields were recorded with application of *Phosphorus* at 1.5 times rate based on the soil test.
- Application of *Phosphorus* at 2 times rate based on the soil test lowered the plant height by 5 cm as compared to the check (no *Phosphorus* application). This indicates that doubling the rate of *Phosphorus* application could minimize lodging in barley!

2.2.2 Winter Cereals:

√*Evaluation of Urea, ESN, Urea Super^U, Their Blends, and Urea Treated with Anvol for production of Winter Wheat:*

- Urea, ESN and Urea Super^U, their blends and Anvol treated urea were compared at 120 kg N/ha – all applied at seeding. A no N check, split application of urea (30 kg N/ha at seeding and 90 kg N/ha in spring), urea Super^U @ 100 kg N/ha and urea @ 160 kg N/ha all applied at seeding were also kept as additional checks.
- Pre-Seeding Soil Test in this experiment was Nitrate N: 8 ppm, Ammoniacal N: 7 ppm.
- Application of urea @ 30 kg N/ha + Urea Super^U @ 90 kg N/ha at seeding gave the highest grain (3.87 MT/ha), straw (10.5 MT/ha) and biomass (14.3 MT/ha) yields. The other two treatments that were equally good in grain yields were urea @ 160 kg N/ha (grain yield 3.76 MT/ha) and urea @ 30 kg N/ha + ESN @ 90 kg N/ha (grain yield 3.65 MT/ha).
- Grain and straw yield in no N check were 2.38 MT/ha and 4.89 MT/ha and that with Urea @ 30 kg N/ha at seeding and Urea @ 90 kg N/ha in spring were 2.90 MT/ha and 5.38 MT/ha, respectively, which were no better than the no N check.
- Averaged over 2023 to 2025, application of urea @ 60 kg N/ha + ESN @ 60 kg N/ha at seeding gave the highest grain (5.49 MT/ha), straw (11.0 MT/ha) and biomass (16.3 MT/ha) yields. Urea alone @ 120 kg N/ha produced 4.90 MT/ha grain yield, 9.97 MT/ha straw yield and 14.7 MT/ha biomass yield.

√*Comparative Performance of Urea, ESN, Puryield, and Their Blends in Winter Wheat:* Urea, ESN, PurYield and their blends were compared @ 120 kg N/ha. Pre-Seeding Soil Test: Nitrate N: 8 ppm, and Ammoniacal N: 7 ppm.

- Three best treatments were ESN @ 120 kg N/ha (grain yield 3.41 MT/ha, straw yield 6.79 MT/ha and biomass yield 10.2 MT/ha), urea @ 80 kg N/ha + ESN @ 40 kg N/ha (grain yield 3.32 MT/ha, straw yield 6.95 MT/ha and biomass yield 10.3 MT/ha), and urea @ 60 kg N/ha + ESN @ 60 kg N/ha (grain yield 3.32 MT/ha, straw yield 6.72 MT/ha and biomass yield 10.0 MT/ha).
- Yields with urea alone @ 120 kg N/ha were 2.90 MT/ha grain, 6.40 MT/ha straw and 9.30 MT/ha biomass. Yields from PurYield @ 120 kg N/ha were somewhat better than urea alone @ 120 kg N/ha.
- Averaged over 2024 and 2025, grain yield was the highest (5.01 MT/ha) with urea @ 60 kg N/ha + PurYield @ 60 kg N/ha. Straw and biomass yields from this treatment were 8.38 MT/ha and 13.4 MT/ha), respectively.

2.2.3 Canola:

√*Comparative Performance of Urea, ESN, PurYield and Their Blends in Canola:*

- PurYield (45-0-0), a granular Enhanced Efficiency Fertilizer, consists of urea with an innovative pink proprietary polymer coating. Pre-Seeding Soil Test was: Nitrate N: 38 ppm, and Ammoniacal N: 9 ppm.

- All fertilizers and their blends were compared @ 180 kg N/ha with a check (No N treatment).
- Application of N @ 180 kg N/ha, on an average over N sources/their blends, increased the canola seed yield by 1.34 MT/ha, straw yield by 1.38 MT/ha and biomass yield by 2.80 MT/ha as compared to the check (No N).
- Highest seed yields were recorded with urea @ 180 kg N/ha (5.57 MT/ha), Urea @ 120 kg N/ha + ESN @ 60 kg N/ha (5.26 MT/ha) and PurYield @ 180 kg N/ha (5.09 MT/ha).
- Highest straw (10.9/10.6 MT/ha) and biomass (16.0/16.2 MT/ha) yields were produced with PurYield @ 180 kg N/ha/and urea @ 180 kg N/ha.
- Averaged over 2023-2025, highest seed yields were obtained with Urea @ 180 kg N/ha (4.62 MT/ha), Urea @ 120 kg N/ha + ESN @ 60 kg N/ha (4.61 MT/ha) and PurYield @ 180 kg N/ha (4.48 MT/ha). Highest straw yield (8.67/8.63 MT/ha) was registered with Urea @ 180 kg N/ha/and ESN @ 180 kg N/ha. Biomass yields (13.0-13.3) were highest with Urea @ 120 kg N/ha + ESN @ 60 kg N/ha, PurYield @ 180 kg N/ha and Urea @ 180 kg N/ha.
- *Farmers may wish to try PurYield, if PurYield is less costly than ESN.*

Nitrogen Requirements of Canola Seeded at Different Times:

- Canola seeded at 7 different dates starting with May 12 at weekly intervals till June 23 was compared at 4 different rates of N; 0, 90, 180 and 270 kg N/ha. Pre-Seeding Soil Test was: Nitrate N: 25 ppm, and Ammoniacal N: 8 ppm.
- Maximum seed yield (7.30 MT/ha) was recorded with seeding on May 12 and application of 270 kg N/ha. Next best seed yield (6.97 MT/ha) was recorded with seeding on May 12 and application of 180 kg N/ha. Seeding on May 12 and application of 90 kg N/ha and seeding on May 19 with application of 180 kg N/ha, gave similar seed yields (6.93/6.94 MT/ha) to seeding on May 12 and application of 180 kg N/ha.
- Maximum straw (13.6 MT/ha) and biomass (20.5 MT/ha) yields were obtained with seeding on May 19 and application of 180 kg N/ha.
- Averaged over N rates, delay in seeding by one week, two weeks, three weeks, four weeks, five weeks and six weeks lowered the seed yield by 0.36 MT/ha, 1.03 MT/ha, 2.34 MT/ha, 3.19 MT/ha, 3.66 MT/ha and 4.33 MT/ha, respectively. Therefore, best times of seeding canola would be May 12/and May 19. Seeding of canola shouldn't be delayed beyond June 2.
- Averaged over seeding dates, seed yield (4.73 MT/ha) didn't increase beyond application of 180 kg N/ha, though the straw (10.1 MT/ha) and biomass (14.9 MT/ha) yields were highest at 270 kg N/ha.
- Interaction between seeding dates and N rates was significant. N could be applied @ 270 kg N/ha with seeding on May 12, @ 180 kg N/ha with seeding on May 19, June 9 and 23, and @ 90 kg N/ha on May 26 and June 16.
- *Early seeding of canola and application of N @ 270 kg N/ha would be best to maximize seed yield of canola.*

√Measuring GHG from Different Sources of N Applied to Canola:

- *Urea, ESN, PurYield, Urea Super^{U} and Anvol treated Urea* @ 180 kg N/ha were compared along with a no N (check) treatment for GHG emissions from canola and yield.
- Highest seed yield was obtained with *PurYield* (5.32 MT/ha) and *ESN* (5.29 MT/ha), whereas highest straw (9.24 MT/ha) and biomass (14.5 MT/ha) yields were recorded with *ESN*.
- Seed, straw and biomass yields without application of N fertilizers were 2.80 MT/ha, 5.17 MT/ha and 8.0 MT/ha, respectively.
- Post harvest soil N analysis indicated lowest nitrate N (5 ppm) and ammoniacal N (9 ppm) in the check (no N) treatment and highest nitrate N (22 ppm) and ammoniacal N (13 ppm) with *Urea Super^{U}*, which means 140 kg total mineral N/ha was left unused from the *Urea Super^{U}*, which if not lost over winter could be utilized by the next crop.
- Farmers may use *PurYield* or *ESN*; the latter may be preferred, if straw is also required.

√Evaluation of TAPP 3 for Canola Production:

- *TAPP 3* is a phosphorus fertilizer that contains 25 % P_2O_5, 8% K_2O, 7.5 % S, 12.5 % Ca and 1.6 % Mg. *TAPP* was compared with *MAP* @ 25, 37.5 and 50 kg P_2O_5/ha. K, S, and B were kept equal in all the treatments. Pre seeding P test was 10 ppm.
- Maximum seed (5.43 MT/ha), straw (8.93 MT/ha) and biomass (14.4 MT/ha) yields were recorded with *MAP* 25 kg P_2O_5/ha.
- Second best treatment in terms of seed yield (5.19 MT/ha) was *TAPP* @ 25 kg P_2O_5/ha. Second best straw (8.92 MT/ha) and biomass (13.8 MT/ha) yields were obtained with *TAPP* @ 37.5 kg P_2O_5/ha.
- Averaged over rates of P_2O_5 application, *TAPP* and *MAP* equaled in seed, straw and biomass yields. Both *TAPP* and *MAP* gave higher seed, straw and biomass yields than the check (No P_2O_5).
- Averaged over sources of P_2O_5, 25 kg P_2O_5/ha produced the highest seed (5/31 MT/ha), straw (8.65 MT/ha) and biomass (14.0 MT/ha) yields.

√*Residual Effect of MAP + MST as a Source of Sulphur on Canola after Canola-Wheat:*

- Residual effect of S applied to canola in 2023, as *MAP + MST* or *ammonium sulphate* or their combinations, on third year canola after canola - wheat was significant i.e., S applied in 2023 improved the third year canola seed yield significantly by 1.34 to 2.21 MT/ha.
- Maximum seed yield (4.97 MT/ha) was recorded with 36 kg S/ha; 12 kg S/ha from *ammonium sulphate* + 24 kg S/ha from *MAP + MST*. The next best seed yield (4.83 MT/ha) was obtained with 18 kg S/ha from *ammonium sulphate* + 18 kg S/ha from *MAP + MST*/or 36 kg S/ha from *MAP + MST*.
- Maximum straw (9.24 MT/ha) and biomass (14.2 MT/ha) yields were obtained with application of S @ 36 kg S/ha; 12 kg S/ha from *ammonium sulphate* + 24 kg S/ha from *MAP + MST*.
- Averaged over S sources, S @ 36 kg/ha significantly improved the seed yield by 1.78 MT/ha, straw yield by 1.76 MT/ha and biomass yield by 3.50 MT/ha.
- Averaged over S rates, *MST* produced the highest seed yield (4.80 MT/ha). Combined application of *ammonium sulphate* and *MAP + MST* gave the highest straw (8.83 MT/ha) and biomass (13.5 MT/ha) yields.
- Averaged over 2023 - 2025, maximum seed (4.79 MT/ha) and biomass (12.9 MT/ha) yields were recorded with 36 kg S/ha; 12 kg S/ha from *ammonium sulphate* + 24 kg S/ha from *MAP + MST*. However, maximum straw yield (8.66 MT/ha) was obtained with the application of 36 kg S/ha; half from *ammonium sulphate* and half from *MAP + MST*.
- *From the three years results, it could be concluded that the S application @ 36 kg Sa/ha significantly improved the seed, straw and biomass yields of third crop of canola (after canola wheat) and the combined application of the two fertilizers (*12 kg S/ha from *ammonium sulphate* + 24 kg S/ha from *MAP + MST) proved better than either of the two fertilizers applied alone!*

√*Residual Effect of SymTRX S10 as a Source of Sulphur on Canola after Canola-Wheat:*

- Residual effect of S applied to canola in 2023, as *SymTRX S10* or *ammonium sulphate* or their combinations, on third year canola after canola - wheat was significant i.e., S applied in 2023 improved the third year canola seed yield significantly by 0.57 to 1.42 MT/ha.
- Maximum seed (5.12 MT/ha), straw (8.61 MT/ha) and biomass (13.70 MT/ha) yields were obtained with the application of S @ 36 kg/ha from *ammonium sulphate*. Seed, straw and biomass yields with the application of *SymTRX S10* @ 36 kg S/ha were 4.65, 8.41 and 13.10 MT/ha, respectively.
- Averaged over S sources, application of S @ 36 kg/ha increased the seed yield by 0.88 MT/ha, straw yield by 0.92 MT/ha, and biomass yield by 1.90 MT/ha.
- Averaged over S rates, ammonium sulphate produced the highest seed yield (4.71 MT/ha), very closely followed by *SymTRX S10* (4.65 MT/ha). Straw (7.42 MT/ha) and biomass (11.56 MT/ha) yields were the highest with *SymTRX S10*.
- Averaged over 2023 to 2025, 36 kg S/ha increased the seed, straw and biomass yields by 1.05, 0.89 and 1.9 MT/ha as compared to the check (No S). And, ammonium sulphate was somewhat

better than *SymTRX S10* in the seed, straw and biomass yields. In other words, *SymTRX S10, as a source of S, was no better than ammonium sulphate!*

√*Effect of High Rates of Boron on Canola (seeded late on May 31, 2024):*

- *Boron* application @ 0, 1, 2, 3, 4 and 5 kg B/ha was tested in canola.
- Highest seed (6.89 MT/ha), straw (14.20 MT/ha) and biomass (21.10 MT/ha) yields were obtained with 3 kg B/ha.
- Increasing the rate of B application from 3 kg/ha upwards to 5 kg/ha didn't increase the seed, straw or biomass yield further. Seed, straw and biomass yields at 5 kg B/ha were 5.20, 10.70 and 15.90 MT/ha.
- Averaged over 2024-2025, highest seed (5.53 MT/ha), straw (10.60 MT/ha) and biomass (16.20 MT/ha) yields were recorded at 3 kg B/ha.
- Boron toxicity is often dreaded! However, it is clear from this experiment that there was no B toxicity in canola even at a high rate of B application (5 kg B/ha).

√*Effect of Holganix 800$^+$ on N Requirements of Canola:*

- Soil application of *Holganix 800$^+$* @ 4.7 l/ha at seeding was compared with no *Holganix 800$^+$* application at 5 rates of N; 0, 60, 120, 180 and 240 kg N/ha.
- Pre-Seeding Soil Tests were: Nitrate N: 12 ppm, Ammoniacal N: 4 ppm.
- Seed yield with soil application of *Holganix 800$^+$* @ 120 kg N/ha (6.24 MT/ha) seemed to be higher than that without *Holganix 800$^+$* application @ 180 kg N/ha (5.72 MT/ha).
- Averaged over N rates, *Holganix 800$^+$* application didn't improve seed yield, though it increased the straw yield marginally (by 0.36 MT/ha).
- Averaged over *Holganix 800$^+$* treatments, highest seed (5.67 MT/ha), straw (11.6 MT/ha) and biomass (17.3 MT/ha) yields were obtained with 120 kg N/ha.

√*Effect of Holganix 800$^+$ on P Requirements of Canola:*

- Soil application of *Holganix 800$^+$* @ 4.7 l/ha at seeding was compared with no *Holganix 800$^+$* application at 5 rates of P; 0, 10, 20, 30 and 40 kg P_2O_5/ha. Pre-Seeding Soil Test was; P: 11 ppm.
- Highest seed yield (6.03 MT/ha) was obtained with the application of 30 kg P_2O_5/ha without application of *Holganix 800$^+$*.
- Highest straw (14.1 MT/ha) and biomass (19.5 MT/ha) yields were recorded with soil application of *Holganix 800$^+$* @ 4.7 l/ha and 10 kg P_2O_5/ha.
- Averaged over P rates, *Holganix 800$^+$* application lowered the seed yield by 0.37 MT/ha as compared to no application of *Holganix 800$^+$*, though *Holganix 800$^+$* seemed to increase the straw yield by 0.80 MT/ha.
- Averaged over *Holganix 800$^+$* treatments, highest seed (5.72 MT/ha) straw (11.7 MT/ha) and biomass (17.4 MT/ha) yields were registered with the application of 20 kg P_2O_5/ha.
- Seed yield increase by P was up to 10 kg P_2O_5/ha without *Holganix 800$^+$* and up to 20 kg P_2O_5/ha with *Holganix 800$^+$*.

2.2.4 Wheat, Barley, and Canola

√*Effect of Different Rates of Potassium on Wheat, Barley, and Canola:*

- Maximum grain (3.54 MT/ha), straw (6.02 MT/ha) and biomass (9.6 MT/ha) yields in wheat were recorded with 1.5 times recommended K_2O rate on soil test basis. Pre seeding K test was 130 ppm.
- Barley produced the maximum grain (6.51 MT/ha), straw (7.59 MT/ha) and biomass (14.1 MT/ha) yields at double the recommended K_2O rate on soil test basis.
- In canola, maximum grain (6.56 MT/ha), and biomass (14.8 MT/ha) yields were obtained at double the recommended K_2O rate on soil test basis. Surprisingly, straw yield (8.40) was highest without application of K.

2.2.5 Alfalfa

√*Effect of time of application of P and K on alfalfa:*

- The experiment was seeded in 2024 and harvested in 2025. Treatments included application of P and K every year and all P and K for four years applied in the seeding year. In the latter case, P treatments were supplemented with Zn and K treatments were supplemented with Mg to counter act the antagonistic effect of P and K on Zn and Mg, respectively.
- Highest dry matter yields of alfalfa from the two cuts were obtained with application of P as per soil test every year (5,077 kg/ha), P applied as per soil test, no K (4,985 kg/ha) and K applied as per soil test, no P (4,786 kg/ha).
- Application of P and K, total amount for 4 years applied in the seeding year, tended to lower the dry matter yield, K did that more than P. However, application of Mg with K counter acted the adverse effect of excessive K on the dry matter yield.
- In the first cut, alfalfa had the highest protein content (21.2 %) when P and K were not applied. In the second cut, application of P as per soil test every year gave the highest protein content (22.2 %) in alfalfa.
- P for four years all applied in the seeding year resulted in the highest RFV (143) in the first cut, whereas in the second cut, highest RFV (148) was obtained with the application of P every year as per soil test.

√*Cutting Management and Fertilizers Requirements of Alfalfa:*

- Four varieties of alfalfa (*Response WT*, *Revolution MD*, *Elite* and *SW 4107*) were evaluated for two and three cuts each at normal fertilizers application and at three cuts with 1.5 times normal fertilizers.
- Maximum dry mater yield was obtained with three cuts of *Elite* (6,116 kg/ha) at the normal rate of fertilizers application, closely followed by three cuts of *Revolution MD* (5,953 kg/ha) with normal rate of fertilizers application, and *Response WT* (5,953 kg/ha) with three cuts at 1.5 times normal rate of fertilizers application.
- Averaged over number of cuttings and fertilizer rates, dry matter yield of alfalfa was in the order of *Response WT* (5,308 kg/ha) = *Revolution MD* (5,302 kg/ha) ≥ *Elite* (5,266 kg/ha) ≥ *SW 4107* (5,078 kg/ha).
- Averaged over varieties, dry matter yield of alfalfa was in the order of three cuts with normal fertilizers (5,841 kg/ha) ≥ three cuts with 1.5 times normal fertilizers (5,713 kg/ha) > two cuts with normal fertilizers (4,162 kg/ha).
- In the first cut, *Revolution MD* recorded maximum protein content at 1.5 times normal fertilizers (20.0 %)/or at the normal fertilizers application (19.7 %). In the second cut, *Response WT* with three cuts at normal fertilizers rates, *Revolution MD* with two cuts at normal fertilizers rates, *Revolution MD* with three cuts at 1,5 times normal fertilizers rates, and *Elite* with three cuts at 1.5 times normal fertilizers rates had similar protein content (20.0 to 20.3 %), though somewhat higher than the other treatments. In the third cut, *Elite* with three cuts at 1.5 times normal fertilizers rates had the highest protein content (20.1 %).

2.3 Bio Products and Other Agronomic Practices:

√*Effect of Holganix 800^{+} on Winter Wheat and Winter Rye:*

- *Holganix* contains 800^{+} microorganisms, mainly bacteria and was applied either as soil application at seeding or as foliar application at tillering @ 4.7 l/ha.
- *Holganix 800^{+}* appeared to increase the winter wheat grain yield from 4.19 MT/ha in check (no *Holganix 800^{+}*) to 4.64 MT/ha with its soil application and to 4.32 MT/ha with its foliar application. However, *Holganix 800^{+}* seemed to increase the winter rye grain yield only marginally from 6.06 MT/ha in check (no *Holganix 800^{+}*) to 6.19 MT/ha with its soil application. Foliar application of *Holganix 800^{+}* lowered the winter rye grain yield, though only marginally by 0.16 MT/ha.
- Averaged over *Holganix 800^{+}* treatments, winter rye produced 1.67 MT/ha higher grain yield and 2.31 MT/ha higher straw yield than wheat.

- Averaged over winter rye and winter wheat, soil application, but not the foliar application of *Holganix 800*$^{+}$, increased the grain yield by 0.30 MT/ha. Straw yield was highest (7.35 MT/ha) without application of *Holganix 800*$^{+}$.

√*Evaluation of SVGOLD Azotobacter for Wheat, Barley, and Canola Production:*

- *Azotobacter* was applied on the soil surface @ 5 l/ha and incorporated in the soil at seeding.
- *Azotobacter* seemed to improve the grain, straw and biomass yields of wheat and barley, but lowered the seed, straw and biomass yields of canola.
- Grain yield increase by Azotobacter was 0.40 MT/ha in wheat and 0.17 MT/ha in barley and decrease in canola seed yield was 0.65 MT/ha; though these yield differences were statistically non-significant.
- Averaged over crops, *Azotobacter* didn't improve the grain or seed yield. However, *Azotobacter* improved the straw and biomass yield by ~0.50 MT/ha, though non-significantly.
- Averaged over *Azotobacter* treatments, grain/seed yields were in the order of *Barley* (5.48 MT/ha) > *Wheat* (4.13 MT/ha) ≥ *Canola* (4.05 MT/ha).

√*Effect of Seeding Dates on Winter Wheat Yield:*

- Winter wheat (cultivar *AAC Gateway*) was seeded on August 25, September 5, September 15, September 25 and October 5.
- Highest grain yield (5.72 MT/ha) was obtained with seeding on September 15, and the highest straw (10.8 MT/ha) and biomass (15.8 MT/ha) yields were obtained with seeding on August 25.
- Averaged over 2023-2025, dates of seedings had no significant effect on grain yield, which ranged from (5.21 MT/ha) with seeding on September 5 to (5.86 MT/ha) with seeding on August 25. Straw (10.9 MT/ha) and biomass (16.7 MT/ha) yields were highest with seeding on August 25.

√*Effect of Seeding Dates in Winter Camelina:*

- Winter Camelina was seeded on August 15, August 25, September 5, September 15, and September 25. Only the crop seeded on September 5 and 15 survived.
- Seed yields from the two dates of seedings (September 5 and 15), was about the same (1.73/1.71 MT/ha).
- Straw (4.53 MT/ha) and biomass (6.26 MT/ha) yields were higher with seeding on September 5 than that on September 15 (straw yield 3.73 MT/ha and biomass yield 5.44 MT/ha).

2.4 Extension and Outreach:

LUARS, through its research, extension and outreach activities, have made a significant impact for the betterment of the agricultural industry particularly through 'Crop Diversification' and adoption of 'Beneficial Nutrient Management Practices'. Area farmers continued to diversify their cropping systems, adding new crops/and varieties, and clearing land. They will continue doing tile drainage depending up on the machines and contractors' availability. The impact of our Extension and Outreach activities could be seen in the form of favourable changes as follows:

- Thunder Bay Co-op brought in Truckloads of seeds; Synergy barley - 53 MT, 500 bags of corn, 90 bags of canola and 2 MT of soybean.
- Aiden and Dan Matyasovszky brought a Drone this year and demonstrated application of fertilizers with Drone at the annual summer tour. Area farmers continued to diversify their cropping systems! Some area farmers seeded cover crops in the standing corn with that Drone; Aaron Breukelman fall rye, Gerrit Cramer radish and also crimson clover, and Jim Mol tillage radish and fall rye. Andrew and Gert Brekveld seeded oats + tillage radish as cover crop in 18 acres and another 15 acres seeded after barley with oats, Italian ryegrass, Winfred Brassica, berseem clover and pearl millet mixture for fall grazing. Pearl millet is grown for the first time by an area farmer. Jason Reid grew multi crops as cover crops in 55-60 acres for grazing sheep. Ed Breukelman came back to growing soybean in 52 acres this year. Gerrit Cramer and Ron Petryna are the two other farmers who grew soybean. Mark Bolt and Gerrit Cramer are at least two

farmers who grew winter rye for grain and straw production. Winter rye cultivation acts as a cover crop and produces, forage, grain and straw.

- Joel Veurink is putting a Robot Milk Barn this year, raising the total number of Robot Milk Barns in the area to 20.
- Ryan and Fritz Jaspers grew Brandon (CWRS) wheat in 201 acres and Synasolis barley for grains in 148 acres, and for silage in 33 acres, Liberty canola (L330 and L350) in 314 acres, alfalfa in 100 acres, grass hay in 110 acres and corn (Pride 4646) in 48 acres. Their area under wheat, barley and corn this year was less than last year, but area under canola was more than that in the last year. Their wheat yield seemed to be less this year, corn yield the normal, and barley and canola yields were better than last year. They didn't wish to reveal their yields to all.
- Aaron and Ed Breukelman had canola (InVigor L356) in 100 acres (seed yield 1.3 MT/acre), Synasolis barley in 100 acres (grain yield 2.6 MT/acre), Esma barley in 40 acres (grain yield 2.2 MT/acre), 52 acres Brett Young Armani soybeans in 52 acres (grain yield 1.1 MT per acre), silage corn in ~125 acres and alfalfa in 100 acres from which he got three cuts.
- Clark and Rob Mol grew 75 acres P505MSL canola (seed yield 0.75 MT/acre, low due to severe lodging due to a couple of storms), 108 acres AAC Synergy barley (grain yield 1.5 MT/acre; lower than last year due to lodging), 170 acres silage corn (80 acres P7211 – yield 18 MT/acre; 90 acres Pride 4705HHRR - yield 20 MT/acre), and 172 acres alfalfa. Mols also seeded AAC Coldfront winter wheat this fall on October 3, 2025 in ~35 acres.
- Ben Breukelman had grown 177 acres Synasolis barley (grain yield: 2.5 MT/acre), Pioneer 7389 silage corn in 120 acres with 18 MT/acre yield (at 66 % moisture), which was 1.8 times more than his yield last year. His grain corn (cultivar Pioneer 7211) yield from 45 acres was 4.65 MT/acre (26 % grain moisture). He also grew 167 acres under alfalfa, from which he took three cuts. Ben Breukelman took a break from canola this year.
- Andrew and Gert Brekveld grew 93 acres L233P canola (seed yield 1.1 MT/acre), 61 acres AAC Starbuck wheat (grain yield 1.3 MT/acre), 70 acres silage corn – Horizon HZ1265 and Maizex 6960 (yield 16.8 MT/acre) and barley for silage (yield 8 MT/acre). Brekvelds got higher yields this year as compared to the last year. In addition, they grew alfalfa in 104 acres.
- Jason Reid seeded corn in 40 acres for silage. He didn't know the yield at the time of writing this report, but he said it was very good. Though he had a lot of bear damage this year; worse than he ever had.
- Mark Veurink grew Synasolis barley in 65 acres (grain yield 2.5 MT/ha), 115 acres Starbuck spring wheat (grain yield 2.0 MT/acre), 175 acres Liberty canola (seed yield 1.5 MT/acre), 90 acres corn for silage (yield 19 MT/acre) and 30 acres whole corn (for grain; yield 4 MT/acre). In addition, he seeded winter wheat (cultivar Coldfront); 55 acres direct seeded after alfalfa on September 3, 2025 and 40 acres direct seeded after barley on September 17, 2025. Veurink's crop yields, especially that of canola, were better this year than that in the last year.
- Henry and Peter Aalbers grew Maizex (6960 and 7711) and Horizon silage corn in 65 acres and got 20 % more yield than last year, 200 acres alfalfa + grass (yield 10 MT/acre from two cuts). They had 165 acres under grass hay (yield 4 MT/acre from a single cut), 75 acres under pasture and oats + peas in 70 acres (yield 6-7 MT/acre). Growing oats + peas was aimed to lower grain feed requirements for the dairy cows.
- Richard Templeman grew Brandon wheat in 55 acres and got 1.4 MT/acre grain yield, Liberty canola (L350P) in 90 acres (seed yield 1.2 MT/acre), corn 130 acres, alfalfa in 150 acres and alfalfa + grass mixture in 50 acres.
- Bernie Kamphof grew 285 acres alfalfa grass mixture and had an average yield. He seeded 165 acres of AAC Synergy barley for forage (yield 8.5 MT/acre) and had applied 6.5 gallons/ac 6-24-6 liquid starter fertilizer. Forty out of 165 acres barely was under seeded with 'Quality Seeds' alfalfa. He also planted 210 acres of corn for silage (cultivars Enogen E080Q1-D, Pickseed PS2321, Pioneer P7683, P7211, P7574 and P7389), which had an average yield (13.5

MT/acre). Corn yield was impacted by equipment breakdown and mud issues; delaying harvesting. Kamphof had applied wood ash @ 5 MT/acre to corn in 35 acres.

- Apart from Bernie Kamphof, Peter Brink, Mike Huber, Lee Swearengen and Thunder Bay Community Pasture too applied wood ash!
- Fifteen farmers used land roller for seed bed preparation this year; some did more than once.
- Land clearing to expand farms continued!
- Current acreage under canola is estimated to be more than 1000 acres in a 25 km radius from LUARS.
- Proper crop rotation, high yielding varieties and best nutrient management practices including supply of N from multiple sources (urea, ESN and ammonium sulphate), application of ESN in the seed row, and application of fungicides and plant growth regulators, as recommended by LUARS, were the contributing factors towards reasonably good crop yields. Research at LUARS has proved that use of multiple sources of N instead of its single source was conducive to high yields.
- Inspired by research at TBARS/LUARS dairy farmers around Calgary continued to expand their acreage under MasterGraze corn. TBARS pioneered in research on MasterGraze corn that produced 8 MT dry matter yield/ha in 80 days. Its feeding to dairy cows improved milk yield by 3l/cow/day and butter fat yield from 3.93 % to 4.40 %.
- Richardson International Limited procured 10, 285 MT grains/and seeds (408 MT more than the last year) from local producers as at November 27, 2024 at a value of 3.5-4.0 million dollars (almost same as the last year) from Thunder Bay and Rainy River Districts; more will be received before the year end; because the farmers are still holding their produce, especially canola, which from Thunder Bay alone, is valued to be more than $1,275,000. I believe at least one more Grain Elevator procured grains from the area (volumes not known). This is in addition to some malting barley procured by the Canada Malting Company from our area.
- *It may be noteworthy that the crop varieties mentioned in this section were tested at and recommended by LUARS. Thunder Bay producers are continuing to renovate, expand/or make additions to their fields and dairy operations!*

Dr. Tarlok Singh Sahota CCA **December 1, 2025**
Director LUARS Thunder Bay