

2025 Interim Report
for the
Saskatchewan Pulse Crop Development Board
Exploring the Potential Benefits of Plant Growth Regulators on Saskatchewan Pulse Crops
(Project #AP-2505a)



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5. Introduction (background and rationale, include references to original research projects where necessary)

The Saskatchewan Pulse Growers (SaskPulse) have recently identified exploring the potential responses of major Saskatchewan pulse crops to plant growth regulator (PGR) applications as a priority. Chickpeas, faba beans, field peas, and lentils can all be prone to lodging depending on the specific variety and weather conditions encountered. This project was initiated to explore, under field conditions, the response of field peas, lentils, chickpea, and faba bean to two readily available PGR products, Manipulator 620 and Moddus. These products are being tested both alone, and in combination, as it is expected that there may be synergistic effects of the two being used together due to their slightly different modes of activity and evidence of such synergies in cereal crops.

Plant growth regulators are used in western Canadian production of cereal crops such as wheat, barley, and oats. These products manipulate plant morphology, leading to shorter plants, thicker stems, and a reduced risk of lodging. Two PGR products are commercially available to Saskatchewan producers and registered for wheat, barley and oats; Manipulator 620 (chlormequat chloride) and Moddus (trinexapac-ethyl). Both chemistries work by inhibiting gibberellin (GA) biosynthesis pathways which, in turn, reduces height and lodging. Chlormequat chloride works by obstructing early stages of GA biosynthesis by blocking the cyclases copalyl-diphosphate synthase and ent-kaurene synthase while Trinexapac interferes with the later stages of GA biosynthesis, resulting in lowered levels of biologically active GA1 and its metabolite GA8, but increased concentrations of GA20 and earlier precursors of GA1 (Strydhorst et al. 2018). Globally, PGR are also used in

other crops with different effects such as lower incidence of scab in apple trees (Spinelli et al. 2010), suppressing vertical growth in ornamental peppers (Mutlu and Kurtulan 2015), improving flower bud quality and fruit set in pear (Theron et al. 1998), and increasing inflorescence in red clover seed production (Anderson et al. 2011). One investigation into PGR application and stubble height effects on field peas by Strydhorst et al. (2018) occurred from 2015-2017 at three field sites in Alberta. While interrow seeding into taller stubble frequently improved standability, results of PGRs were variable, with occasional but seemingly cultivar specific reductions in plant height that seemed to be cultivar specific. Significant yield responses were detected at 22% of sites; however, the response was negative for drought affected sites. The quality effects were such that 4/9 sites showed a significant, but inconsistent, response for seed weight and there were no significant effects on seed protein concentrations. To the best of our knowledge, no public work had been done to investigate the use of PGR on field pea in western Canada prior to Strydhorst (2018) and no public work has explored PGR responses to lentil, faba bean, or chickpea.

Literature Cited

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Theron, K.Y., du Plessis, P., Griessel, H.M. 1998. Effect of an autumn application of chlormequat on reproductive bud development, fruit set and production of the pear cv. Doyenne du comice. *Acta Hortic.* **475**: 251-264.

6. Objective(s) or purpose of the project

The overall project objective was to explore the responses and potential benefits of applying gibberellin inhibiting plant growth regulators (PGR) to the predominant pulse crops grown in Saskatchewan. Specifically, we set out to investigate how chickpea (*Cicer arietinum.*), faba bean (*Vicia faba*), lentil (*Lens culinaris*), and field pea (*Pisum sativum*) respond to applications of chlormequat chloride and trinexapac-ethyl, alone or in combination.

7. Materials and Methods (experimental design, methods used, details of growing the crop(s), materials used, sites, statistical analyses, etc.)

Field trials were established at seven locations in 2025 to explore the potential benefits of applying plant growth regulators (PGR) on several of the major pulse crop options for Saskatchewan farmers. The locations spanned all major growing regions and included Swift Current (dry Brown soil zone), Outlook (irrigated Brown soil zone), Scott (Dark Brown soil zone), Indian Head (thin Black soil zone), Yorkton (Black Soil Zone), Melfort (moist Black soil zone), and Prince Albert (moist Black soil zone). Not all crop types were grown at all locations and several of the crops were grown outside of their typical growing regions (Table 1). Each crop was grown in a separate, four replicate Randomized Complete Block Design (RCBD). The treatments were

simply four PGR treatments which were an untreated control (UTC), trinexapac-ethyl/ha (TXP), chlormequat chloride (CC), or a tank-mix of both products applied simultaneously at half rates (MIX). The treatments were applied at a target growth stage of approximately 8-10 nodes, after the in-crop herbicides but prior to bud formation, and in a minimum of 93 l/ha solution volume, but with higher volumes being permitted to ensure accurate application rates and adequate coverage. Detailed information on PGR products and rates is in Table 2 while dates of the PGR applications are presented alongside other key dates and selected agronomic information in Tables 31-34 of the Appendices.

Table 1. Plant growth regulator (PGR) trial locations for each pulse crop type.

Location	Field Pea	Lentil	Chickpea	Faba bean
Indian Head (IHARF)	Yes	Yes	Yes	Yes
Melfort (NARF)	Yes	Yes	Yes	Yes
Prince Albert (CLC)	Yes	Yes	No	Yes
Outlook (ISask)	Yes	Yes	Yes	Yes
Scott (WARC)	Yes	Yes	Yes	Yes
Swift Current (WCA)	Yes	Yes	Yes	No
Yorkton (ECRF)	Yes	No	No	Yes

Table 2. Proposed PGR treatments to be evaluated for field pea, lentil, chickpea, and faba bean.

#	Product ^z	Application Rates ^y
1	Untreated Control (UTC)	n/a
2	Moddus (121.4 g Trinexapac-ethyl/l)	125 g ai/ha (417 ml Moddus/ac)
3	Manipulator (620 g chlormequat chloride/l)	1426 g ai/ha (931 ml Manipulator/ac)
4	Moddus + Manipulator	62.5 + 713 g ai/ha (208 ml Moddus + 465 ml Manipulator/ac)

^z All PGR treatments are to be applied at the 8-10 node stage, after in-crop herbicides but prior to bud formation

^y Application rates for each product applied on its own are based off labels for barley use (higher than wheat) and tank-mix rates are based on the 'split application' rates on label for each product.

Plot sizes varied by location to accommodate differences in seeding and spraying equipment. All controllable factors were intended to be non-limiting and all sites followed best management practices to the best of their ability, recognizing that growing some of these crops in their regions may be challenging. In all cases, the plots were established in cereal stubble with seeding rates of 50 seeds/m² for chickpeas and faba beans, 190 seeds/m² for lentils, and 100 seeds/m² for field peas. All sites used the same varieties: CDC Lancer Kabuli chickpea, CDC 1089 low tannin faba bean, CDC Nimble small red lentil, and CDC Profit yellow field pea. Fertility was non-limiting with phosphorus, potassium, and sulfur applied as required along with in-furrow granular rhizobial inoculant tailored to the individual crops. Crop protection was at the discretion of individual site managers; however, the plots were required to be reasonably weed free throughout the season. Treating seed for root disease and (for faba bean and field pea) pea leaf weevil along with preventative fungicide applications were strongly recommended. Preharvest herbicide or desiccants were also at the discretion of site managers, but recommended to ensure timely harvest and the best quality seed samples for post-harvest analyses. When the plots were mature and dry, the plots were straight-cut using small plot combines, excluding outside rows wherever possible to minimize edge effects.

Various data were collected during the growing season and from the harvested seed samples. Spring plant densities for each plot were estimated by counting seedlings in a minimum of 2 x 1 m sections of crop row

and converting the averaged values to plants/m². The Julian date when approximately 10% of plants had at least one open flower was recorded so that we could calculate days from seeding to first flower. This information was primarily used as an indicator of the relative PGR application timing at each site. Plant height was estimated at physiological maturity by measuring the fully extended height of a minimum of eight plants/plot to the nearest 1 cm and averaging the values. The Julian date when the plots reached physiological maturity was recorded and days from seeding to maturity calculated. The definition of physiological maturity varied with crop. Chickpea were considered mature when, for most plants in a plot, the pods were yellow to brown in colour and 80-90% leaf drop had occurred. For faba bean, maturity was when 80% of pods had started to turn colour and approximately one-third had completely turned. Lentil were mature when the bottom third of pods had turned yellow to brown and the seeds inside rattled when shaken. For field pea, we looked for the bottom pods to be ripe, the uppermost pods to have started to turn, and 70% of pods to have turned or be turning brown. Prior to harvest, lodging was rated on a scale of 0-9 where 0 indicates no lodging and 9 indicates severe lodging. Seed yields for each plot were estimated by weighing the harvested seed samples, correcting for dockage and to uniform moisture content of 13% for lentil, 14% for chickpea, and 16% for faba bean and field pea, and converting the weights to a standardized unit of kg/ha. Thousand seed weights were estimated for all crops by counting and weighing a minimum of 250 whole seeds from the harvest sample and calculating g/1000 seeds. Grain protein concentrations were estimated for faba bean and field pea on behalf of all sites by IHARF by averaging the results from a minimum of three runs through FOSS Infratech Nova NIR analyzer. Protein is expressed on dry seed basis, by mass. For chickpeas, the seed diameters were measured by recording the mass of seed from two separate 250 g (whole seed) subsamples that stayed on top of 5, 6, 7, 8, 9, and 10 mm round hole hand sieves. The protocol for this procedure is outlined by the Canadian Grain Commission (<https://www.grainscanada.gc.ca/en/grain-quality/official-grain-grading-guide/22-chickpeas/determination-dockage.html>).

At this stage of the project, data for each crop are analyzed and summarized for each site individually so that we can identify meaningful trends and assess data quality prior to any final, combined analyses. Data for each response variable were analyzed using generalized linear mixed model (GLIMMIX) procedure of SAS Studio with effects of PGR consider fixed and replicate effects treated as random. Where justified by the overall tests of fixed effects, Fisher's protected LSD test was used to separate treatment means. No data has been discarded or transformed (to meet assumptions about normal distribution) at this stage; however, these options will be explored prior to any final analyses upon conclusion of the project. All treatment effects and differences between means were considered significant at $P \leq 0.05$; however, meaningful trends or p-values ≤ 0.10 may also be acknowledged.

- 8. Results and Discussion** (results presented and discussed in the context of existing knowledge and relevant literature or comparison to existing recommendations, detail any major concerns or sources of error, provide proper statistical significance)

Growing Season Weather

Mean monthly temperatures and precipitation totals for May through August are provided relative to the long-term (1981-2010) averages in Tables 35 and 36 of the Appendices. Due to the longer growing season requirements of chickpea and faba bean, September weather details are also provided, but not included in seasonal averages/totals. Over the four-month period, temperatures ranged from 0.9 °C below average at Prince already to 0.7-0.8 °C above average at Swift Current, Yorkton, and Melfort. May and August were consistently warm while June was variable and July, to varying degrees, was cool. The cool July temperatures were due in part to smokey conditions, particularly at the more northern locations. For all locations in 2025, September had well above-average temperatures which were likely to help any later chickpeas or faba beans mature. Growing season precipitation was also highly variable across locations. Soil moisture at Indian

Head was initially adequate but became drier as the season progressed with only 136 mm from May through August, 56% of average. By contrast, and rather unexpectedly, Swift Current was amongst our wetter locations with 236 mm or 110% of their long-term average; however, majority of the precipitation here was considered late and caused regrowth leading to variability and harvest challenges. The remaining locations were more intermediate with 72-105% of average or 195-237 mm of precipitation over the four-month period. The Outlook site received an additional 137 mm as irrigation, bringing the four-month total to 347 mm at this location. September precipitation was variable and, again, likely did not provide much benefit to the current crops except for chickpeas and faba beans at some locations.

Introduction to Trial Results

As stated earlier, we will look at the basic results individually for each crop type/location at this stage of the project. The primary objectives are to assess data quality while identifying meaningful trends. While plant densities were analyzed in a similar manner as the other variables, these measurements were completed prior to any treatment applications and only included in the data collection as a measure of overall establishment and uniformity within sites. As such, only site effects will be included in the model for the final, combined analyses for this variable. For each crop, the locations are sorted from what are typically the warmest, driest locations to the more northern, cooler and wetter locations.

Chickpea: Swift Current 2025

For chickpeas at Swift Current, the PGR treatments were applied 20 days before the onset of flowering (Table 31). Establishment was excellent and quite uniform, with observed plant densities exceeding our target seeding rate and no PGR effect ($P = 0.766$; Table 3). Plant heights were not significantly affected by the treatments ($P = 0.168$); however, there was a trend for shorter plants with TXP. No lodging was observed, regardless of treatments, and maturity was relatively early for chickpeas (113 days on average) and not significantly affected by PGR ($P = 0.318$). Yields were quite high and somewhat variable, but not to the extent that we would hesitate to include it in the final, combined analyses. Yields were not affected by PGR ($P = 0.900$). Neither thousand seed weights ($P = 0.772$) nor chickpea size profiles (Table 4; $P = 0.084-0.679$) were affected by PGR at Swift Current in 2025 and there are no concerns with data quality for either of these variables. For the chickpea seed diameter data, we will explore data transformations prior to any combined analyses to help ensure that the assumptions about normal distribution are met.

Table 3. Plant growth regulator effects on selected response variables for chickpeas at Swift Current, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher’s protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --
Control (UTC)	82 a	35.0 a	0.0	112.8 a	3151 a	325 a
Moddus (TXP)	77 a	31.1 a	0.0	112.5 a	3177 a	322 a
Manipulator (CC)	79 a	34.0 a	0.0	114.5 a	3344 a	329 a
Tank-Mix (MIX)	78 a	33.0 a	0.0	112.8 a	3150 a	323 a
S.E.M.	3.3	1.44	–	0.95	244.7	5.3
Pr > F (p-value)	0.766	0.168	–	0.318	0.900	0.772
LSD _{0.05}	ns	ns	–	ns	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Table 4. Plant growth regulator effects on chickpea seed diameters at Swift Current, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment	$\geq 5\text{mm}$	$\geq 6\text{mm}$	$\geq 7\text{mm}$	$\geq 8\text{mm}$	$\geq 9\text{mm}$	$\geq 10\text{mm}$
	----- % -----					
Control (UTC)	99.7 a	99.1 a	93.9 a	72.5 a	24.5 a	1.4 a
Moddus (TXP)	99.4 a	98.6 a	93.1 a	68.6 a	21.8 a	1.6 a
Manipulator (CC)	99.6 a	99.1 a	94.6 a	72.3 a	22.9 a	1.2 a
Tank-Mix (MIX)	99.6 a	98.7 a	93.2 a	71.2 a	23.6 a	2.0 a
S.E.M.	0.10	0.20	1.00	2.06	1.56	0.32
Pr > F (p-value)	0.084	0.167	0.671	0.539	0.679	0.391
LSD _{0.05}	ns	ns	ns	ns	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Chickpea: Outlook 2025

Results for the chickpeas at Outlook 2025 are presented in Tables 5-6 below and, at this site, the PGR treatments were applied 18 days prior to flowering. Plant densities were unusually low, ranging from 9-11 plants/m², but not affected by PGR ($P = 0.793$). It is possible that data these measurements were completed prior to emergence was complete and, as such, while there may not be a need to discard the data it should be interpreted cautiously. Plant heights were quite variable and, as such, no differences between PGR treatments were significant ($P = 0.451$) despite noticeably lower values in the MIX treatment. Lodging was reported with differences between PGR treatments detected; however, the lowest values were reported in the UTC which would not be an expected result. The chickpeas took extremely long to mature at this location, averaging 135 days from seeding to maturity; however, PGR had no effect ($P = 0.436$). Outlook was our lowest yielding chickpea site, and under these stressful conditions, the PGR effect was significant ($P = 0.041$) with reduced with reduced yield in both the TXP and MIX treatments, relative to the UTC. The magnitude of the yield reduction in these treatments was substantial at 347-388 kg/ha or 15-17%. Both thousand seed weights and seed diameters (Table 6) were also relatively low at this site but not affected by the PGR treatments ($P = 0.194$ - 0.991). While the data for several variables were less consistent than would be ideal for the chickpea at Outlook in 2025, we do not specifically foresee excluding anything from the final, combined statistical analyses at this time.

Table 5. Plant growth regulator effects on selected response variables for chickpeas under irrigation at Outlook, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --
Control (UTC)	11 a	52.0 a	2.5 b	134.8 a	2338 a	273 a
Moddus (TXP)	9 a	51.4 a	3.0 ab	135.3 a	1950 b	270 a
Manipulator (CC)	9 a	52.3 a	3.8 a	135.0 a	2135 ab	274 a
Tank-Mix (MIX)	9 a	46.3 a	2.8 b	135.3 a	1991 b	260 a
S.E.M.	1.7	3.11	0.36	1.28	108.1	7.2
Pr > F (p-value)	0.793	0.451	0.041	0.436	0.023	0.194
LSD _{0.05}	ns	ns	0.84	ns	244.5	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Table 6. Plant growth regulator effects on chickpea seed diameters at Outlook, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment	$\geq 5\text{mm}$	$\geq 6\text{mm}$	$\geq 7\text{mm}$	$\geq 8\text{mm}$	$\geq 9\text{mm}$	$\geq 10\text{mm}$
	----- % -----					
Control (UTC)	99.5 a	96.0 a	84.6 a	48.8 a	2.2 a	0.0
Moddus (TXP)	99.3 a	95.8 a	83.3 a	46.6 a	2.4 a	0.0
Manipulator (CC)	99.4 a	95.9 a	82.9 a	48.7 a	3.2 a	0.0
Tank-Mix (MIX)	99.5 a	95.8 a	82.2 a	44.0 a	2.2 a	0.0
S.E.M.	0.14	0.75	2.55	3.10	0.45	–
Pr > F (p-value)	0.843	0.991	0.783	0.465	0.454	–
LSD _{0.05}	ns	ns	ns	ns	ns	–

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Chickpea: Scott 2025

For chickpea at Scott in 2025, the PGR treatments were applied 18 days ahead of flowering. Establishment was excellent and reasonably uniform with no PGR effects detected ($P = 0.634$; Table 7). Plant height was not affected by PGR ($P = 0.112$); however, there was a strong trend for shorter plants with TXP and the MIX treatments that may become important with more powerful statistical analyses. No lodging was observed at this location and maturity was reached in 124 days from seeding and not affected by the PGR treatments ($P = 0.436$). Yields were high and not significantly affected by PGR ($P = 0.187$); however, there was a slight trend for lower yields with TXP and MIX which were also the two shortest treatments. These treatments (TXP and MIX) also tended to have the lowest thousand kernel weights; however, seed weights were quite high for all treatments, and the response was not quite significant at the desired probability ($P = 0.076$). Notably, these treatments also tended to have a lower percentage of seeds with a diameter ≥ 9 mm (Table 8). Overall data quality for the chickpeas at Scott in 2025 were considered excellent for all variables.

Table 7. Plant growth regulator effects on selected response variables for chickpeas at Scott, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --
Control (UTC)	54 a	43.5 a	0.0	124.5 a	4090 a	392 a
Moddus (TXP)	49 a	40.2 a	0.0	124.3 a	3831 a	383 a
Manipulator (CC)	53 a	43.3 a	0.0	123.8 a	4095 a	395 a
Tank-Mix (MIX)	56 a	40.4 a	0.0	123.5 a	3788 a	382 a
S.E.M.	3.8	1.85	–	0.57	117.7	5.1
Pr > F (p-value)	0.634	0.112	–	0.436	0.187	0.076
LSD _{0.05}	ns	ns	–	ns	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Table 8. Plant growth regulator effects on chickpea seed diameters at Scott, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment	≥ 5mm	≥ 6mm	≥ 7mm	≥ 8mm	≥ 9mm	≥ 10mm
	----- % -----					
Control (UTC)	100.0 a	99.9 a	99.3 a	93.8 a	61.9 a	11.5 a
Moddus (TXP)	99.9 a	99.9 a	99.6 a	92.1 a	55.7 a	11.2 a
Manipulator (CC)	100.0 a	99.8 a	99.3 a	92.3 a	60.3 a	9.9 a
Tank-Mix (MIX)	100.0 a	99.8 a	99.3 a	91.7 a	56.4 a	8.1 a
S.E.M.	0.03	0.05	0.26	1.34	3.3	1.59
Pr > F (p-value)	0.894	0.610	0.841	0.497	0.273	0.458
LSD _{0.05}	ns	ns	ns	ns	ns	ns

² PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Chickpea: Indian Head 2025

For the chickpeas at Indian Head, PGR treatments were applied 13 days prior to flowering and results are presented in Tables 9 and 10. Establishment was good overall, reasonably uniform across the trial area and, as expected, not affected by PGR ($P = 0.199$). The height response was significant ($P = 0.021$) and followed a similar trend to Scott whereby heights were slightly reduced relative to the UTC (42 cm) with both TXP and the MIX (40 cm), but not CC (42 cm). The height data were highly consistent at this site and, unfortunate, it is possible that this response may disappear in the final, combined analyses. Lodging was negligible and not affected by the treatments, with all plots receiving a rating of 1/9. Maturity was reached an average of 117 days after seeding and not affected by PGR ($P = 0.619$). Yields were excellent, ranging from 4934-5122 kg/ha with the UTC have intermediate yields and no PGR effect ($P = 0.156$). Thousand seed weights were quite high, averaging 366 g/1000 seeds, and not affected by the treatments. For seed diameters (Table 10), we did see a significant PGR effect ($P = 0.0221$) for seeds ≥ 7 mm, but it was unimportant in practical terms and will likely disappear with any future data transformations and/or combined analyses. Overall data quality was excellent for the chickpeas at Indian Head.

Table 9. Plant growth regulator effects on selected response variables for chickpeas at Indian Head, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ²	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --
Control (UTC)	38 a	42.2 a	1.0	117.3 a	5045 a	364 a
Moddus (TXP)	33 a	39.7 c	1.0	117.1 a	4935 a	362 a
Manipulator (CC)	32 a	41.8 ab	1.0	116.8 a	4934 a	372 a
Tank-Mix (MIX)	38 a	40.4 bc	1.0	117.0 a	5122 a	367 a
S.E.M.	2.5	0.75	–	0.45	68.2	6.5
Pr > F (p-value)	0.199	0.021	–	0.619	0.156	0.157
LSD _{0.05}	ns	1.64	–	ns	ns	ns

² PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Table 10. Plant growth regulator effects on chickpea seed diameters at Indian Head, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher’s protected LSD test, $P \leq 0.05$).

Treatment	≥ 5mm	≥ 6mm	≥ 7mm	≥ 8mm	≥ 9mm	≥ 10mm
	----- % -----					
Control (UTC)	100.0	99.9 a	99.0 a	86.9 a	34.3 a	1.6 a
Moddus (TXP)	100.0	99.9 a	98.1 b	84.0 a	32.8 a	1.6 a
Manipulator (CC)	100.0	99.9 a	99.0 a	89.3 a	36.6 a	1.7 a
Tank-Mix (MIX)	100.0	99.9 a	99.1 a	86.4 a	31.9 a	1.1 a
S.E.M.	–	0.06	0.39	2.19	3.86	0.42
Pr > F (p-value)	–	0.710	0.005	0.107	0.351	0.598
LSD _{0.05}	–	ns	0.51	ns	ns	ns

² PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Chickpea: Melfort 2025

For chickpea at Melfort, the PGR treatments were applied 15 days prior to flowering and results are presented in Tables 11-12. Establishment was variable but not to the extent that it posed concerns for overall data quality and the final plant populations were generally adequate. At only 13 days after seeding, it is likely that these counts were completed before emergence was complete and, while the PGR effect was marginally significant ($P = 0.072$), this was considered a random occurrence. Although mean plant heights ranged from 57-61 cm, these data were too variable for any of differences between means to be considered significant ($P = 0.682$). Lodging was substantial at this location but not affected by PGR. The plots took quite long to mature, averaging 133 days from planting, but were not affected by PGR. Seed yields were intermediate but somewhat variable at Melfort in 2025 with a non-significant ($P = 0.622$) range of 3295-3618 kg/ha across PGR treatments. Thousand seed weights were reasonably high overall but not significantly affected by PGR ($P = 0.638$). Unfortunately, data on seed diameters are not available for this site due to the wrong sieve sizes being used initially and the samples discarded before the measurements could be completed correctly. Otherwise, there are no data quality concerns for chickpeas at Melfort 2025.

Table 11. Plant growth regulator effects on selected response variables for chickpeas at Melfort, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher’s protected LSD test, $P \leq 0.05$).

Treatment ²	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --
Control (UTC)	25 a	60.2 a	6.7 a	132.7 a	3513 a	354 a
Moddus (TXP)	42 a	57.1 a	6.8 a	132.7 a	3567 a	354 a
Manipulator (CC)	36 a	59.3 a	6.2 a	132.7 a	3618 a	365 a
Tank-Mix (MIX)	31 a	60.6 a	6.7 a	133.3 a	3295 a	367 a
S.E.M.	3.8	2.27	0.57	0.60	179.0	8.8
Pr > F (p-value)	0.071	0.682	0.830	0.730	0.622	0.638
LSD _{0.05}	ns	ns	ns	ns	ns	ns

² PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Faba Bean: Outlook 2025

The PGR treatments were applied 21 days prior to flowering for faba bean at Outlook in 2025 (Table 32) and results are presented in Table 12. Emergence was excellent, quite uniform, and not affected by PGR ($P =$

0.746). The PGR effects on plant height were not significant ($P = 0.191$); however, there was a trend for shorter plants with PGR (110-115 cm) relative to the UTC (119 cm). Lodging was minor (1.5-1.8/9) and not affected by PGR ($P = 0.631$). Maturity was typical for faba beans at 114 days and not affected by PGR ($P = 0.802$). Seed yields were high but somewhat variable, ranging from 5752-6165 kg/ha, but with no PGR effect ($P = 0.678$) and intermediate yields in the UTC. Thousand seed weights were extremely and unusually variable and, as such, not affected by PGR ($P = 0.923$) despite ranging from 387-400 g/1000 seeds. Seed protein concentrations were ~28-29% and unaffected by PGR ($P = 0.134$). While somewhat variable, data quality for chickpeas at Outlook was generally considered adequate with the likely exception of thousand seed weights.

Table 12. Plant growth regulator effects on selected response variables for faba beans under irrigation at Outlook, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher’s protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight	Seed Protein
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --	----- % -----
Control (UTC)	45 a	119.1 a	1.8 a	114.0 a	5981 a	391 a	28.4 a
Moddus (TXP)	42 a	115.1 a	1.5 a	114.0 a	5949 a	398 a	28.4 a
Manipulator (CC)	46 a	110.4 a	1.5 a	113.8 a	5752 a	387 a	29.2 a
Tank-Mix (MIX)	44 a	113.4 a	1.8 a	113.8 a	6165 a	400 a	29.0 a
S.E.M.	2.1	3.10	0.27	0.27	234.5	17.0	0.38
Pr > F (p-value)	0.746	0.191	0.631	0.802	0.678	0.923	0.134
LSD _{0.05}	ns	ns	ns	ns	ns	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Faba Bean: Scott 2025

The PGR treatments for faba bean at Scott in 2025 were applied 7 days prior to flowering and results are in Table 13. Establishment was excellent overall and plant densities were not affected by PGR ($P = 0.412$). While mean plant heights were rather variable across treatments (74.5-79.1 cm; $P = 0.093$), the observed mean in the UTC (76.9 cm) was intermediate within the observed range (74.5-79.1 cm). As such, PGR did not appear to have a meaningful impact on this variable. Lodging was negligible across treatments and not affected by PGR ($P = 0.349$). Similarly, maturity was typical for this crop at ~116 days, with no effect of PGR ($P = 0.436$). Yields were quite consistent across treatments (4130-4296 kg/ha) with no PGR effect ($P = 0.552$). Thousand seed weights were also unaffected with a range of 391-401 g/1000 seeds ($P = 0.544$). For seed protein, the PGR effect was significant ($P = 0.008$), despite only ranging from 26.9-27.6%. While these values did seem to correlate with the observed (minor) variation in yields, they did not do so in the typical manner whereby protein becomes diluted as yield increases. Rather, seed protein concentrations were highest in the TXP and MIX treatments that also tended to have the highest yields. Overall, data quality for this site was considered excellent for all response variables.

Table 13. Plant growth regulator effects on selected response variables for faba beans at Scott, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight	Seed Protein
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --	----- % -----
Control (UTC)	38 a	76.9 a	0.8 a	115.5 a	4130 a	401 a	26.9 c
Moddus (TXP)	45 a	74.5 a	1.5 a	116.5 a	4219 a	391 a	27.7 a
Manipulator (CC)	42 a	77.3 a	1.5 a	116.5 a	4200 a	396 a	27.2 bc
Tank-Mix (MIX)	40 a	79.1 a	1.5 a	116.0 a	4296 a	399 a	27.6 ab
S.E.M.	2.9	1.7	0.40	0.48	92.7	5.0	0.18
Pr > F (p-value)	0.412	0.093	0.349	0.436	0.552	0.544	0.008
LSD _{0.05}	ns	ns	ns	ns	ns	ns	0.41

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Faba Bean: Indian Head 2025

Faba bean PGR treatments at Indian Head 2025 were applied 12 days ahead of flowering and results are in Table 14. Seedling mortality was higher than ideal with an average of 30 seeds/m² established; however, the stands were quite uniform and not affected by PGR ($P = 0.241$). Furthermore, the plots tended to fill in after these counts were completed with late rains and recovery of plants affected by minor cutworm feeding. Heights were not affected by PGR ($P = 0.289$) with a narrow ranged of 79.9-81.8 cm across treatments. There was some lodging and treatment means ranged from 2.0-3.0/9 and both the MIX and, to a lesser extent, CC treatments reduced the severity relative to the UTC. Maturity occurred ~111 days after seeding and was not affected by PGR ($P = 0.210$) under the dry late-season conditions at Indian Head in 2025. Seed yields ranged from 4268-4411 kg/ha with both the TXP and CC treatments yielding slightly but significantly higher than the UTC and MIX treatments. Yields were very consistent at this site and, unless the trends are sufficiently consistent, this response will likely disappear in any final, combined analyses. Seed weights were somewhat low under the dry conditions (366-373 g/1000 seeds), but not affected by PGR ($P = 0.555$). Seed protein concentrations were amongst the highest at Indian Head for faba bean in 2025 (30.2-30.6%) but not affected by PGR ($P = 0.622$). Overall, data quality for all variables was considered excellent at this site.

Table 14. Plant growth regulator effects on selected response variables for faba beans at Indian Head, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight	Seed Protein
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --	----- % -----
Control (UTC)	30 a	81.6 a	3.0 a	110.5 a	4289 b	372 a	30.3 a
Moddus (TXP)	28 a	81.8 a	2.5 ab	110.6 a	4390 a	370 a	30.6 a
Manipulator (CC)	30 a	80.7 a	2.4 b	110.8 a	4411 a	373 a	30.2 a
Tank-Mix (MIX)	32 a	79.9 a	2.0 b	110.3 a	4268 b	366 a	30.5 a
S.E.M.	1.1	0.88	0.26	0.26	49.8	3.7	0.23
Pr > F (p-value)	0.241	0.289	0.021	0.210	<0.001	0.555	0.622
LSD _{0.05}	ns	ns	0.569	ns	48.7	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Faba Bean: Yorkton 2025

The PGR treatments for faba bean at Yorkton were applied 19 days ahead of flowering and results are in Table 15. Establishment was excellent with mean plant densities of 48-54 plants/m² and no PGR effect ($P = 0.510$). There was a slight trend for shorter plant heights with TXP and MIX (61.5-63.6 cm) relative to the UTC (67.2 cm); however, overall variability was too high for this to be even marginally significant ($P = 0.530$). While there was some lodging (2.8-3.5/9), the effect was not quite significant ($P = 0.075$) and lodging in the UTC was intermediate suggesting any PGR effect was negligible. Maturity was quite early at this site averaging only 102 days but not affected by PGR ($P = 0.557$). Faba bean yields at Yorkton were amongst the lowest of the sites in 2025 and highly variable. Despite a range of 2990-3313 kg/ha amongst treatments, PGR effects were not significant ($P = 0.867$). Seed weights were also highly variable with no significant PGR effect ($P = 0.147$), despite the range of 370-395 g/1000 seeds. Seed protein concentrations ranged from 26.1-27.1% and were not affected by PGR ($P = 0.160$). Overall, data quality for faba beans at this site were variable and we will exclude both yields and seed weights from any final, combined analyses.

Table 15. Plant growth regulator effects on selected response variables for faba beans at Yorkton, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight	Seed Protein
	--- #/m ² ---	---- cm ----	---- 0-9 ----	--- days ---	--- kg/ha ---	-- g/1000 --	---- % ----
Control (UTC)	52 a	67.2 a	3.3 a	102.0 a	3290 a	384 a	26.9 a
Moddus (TXP)	54 a	63.6 a	3.5 a	102.5 a	3159 a	395 a	27.1 a
Manipulator (CC)	48 a	66.7 a	2.8 a	101.8 a	3313 a	370 a	26.1 a
Tank-Mix (MIX)	53 a	61.5 a	2.8 a	101.3 a	2990 a	384 a	26.4 a
S.E.M.	2.6	3.50	0.26	0.90	402.4	11.1	0.36
Pr > F (p-value)	0.510	0.530	0.075	0.557	0.867	0.147	0.160
LSD _{0.05}	ns	ns	ns	ns	ns	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Faba Bean: Melfort 2025

At Melfort in 2025, PGR treatments were applied to faba bean 6 days before flowering and results are presented in Table 16. Establishment was reasonably good overall with plant densities ranging from 32-39 plants/m² and no significant treatment effects. A significant height response to PGR was detected ($P < 0.001$) whereby the mean faba bean height was reduced by 13%, from 80.4 cm in the UTC to 70.2 cm with the full rate of TXP; however, neither CC nor the MIX were effective. No lodging was observed in any treatments. Maturity was typical for this crop under good growing conditions (~120 days) and not affected by PGR ($P = 0.394$). Faba bean yields were excellent, and quite consistent at Melfort 2025 with reasonably low S.E.M. values relative to the absolute means of 5529-5652 kg/ha but response to PGR ($P = 0.968$). Similarly, the excellent growing conditions at this site resulted in high thousand seed weights (454-462 g/1000 seeds); however, PGR had no effect on this variable ($P = 0.572$). Seed protein concentrations were also reasonably high, consistent (28.8-29.3%) and not affected by PGR ($P = 0.230$). Overall, faba bean data quality from Melfort 2025 was considered excellent overall with no concerns for any of the variable measured.

Table 16. Plant growth regulator effects on selected response variables for faba beans at Melfort, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight	Seed Protein
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --	----- % -----
Control (UTC)	33 a	80.4 a	0.0	118.5 a	5652 a	457 a	29.3 a
Moddus (TXP)	32 a	70.2 b	0.0	120.5 a	5529 a	458 a	29.2 a
Manipulator (CC)	39 a	76.8 a	0.0	119.8 a	5645 a	454 a	28.8 a
Tank-Mix (MIX)	32 a	80.5 a	0.0	119.8 a	5575 a	462 a	28.8 a
S.E.M.	2.4	1.36	–	1.17	212.7	7.8	0.22
Pr > F (p-value)	0.164	<0.001	–	0.394	0.968	0.572	0.230
LSD _{0.05}	ns	3.99	–	ns	ns	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Faba Bean: Prince Albert 2025

For faba bean at Prince Albert 2025, PGR treatments were applied 18 days prior to flowering and results are in Table 17. Establishment was variable but overall adequate with an average of 34 plants/m². Plant heights were similar across PGR treatments on average (67.5-70.2 cm; $P = 0.424$); however, the data were highly variable and may not be reliable. Lodging was substantial with mean ratings of 3.0-4.0/9 but not affected by PGR ($P = 0.316$). On average, maturity was typical for faba beans (116 days), but the overall variability was extremely high with a range of 114-119 days amongst treatments yet no significant PGR effect ($P = 0.375$). Yields were low relative to most other locations and extremely variable, ranging from 3034-3511 kg/ha, yet no PGR effect ($P = 0.837$). This variability also carried through to the seed weights where we saw no PGR effect ($P = 0.343$) despite treatment means ranging from 402-421 g/1000 seeds. Seed protein concentrations were reasonably high (28.7%) and quite consistent, not affected by PGR ($P = 0.904$). Overall, there was no meaningful evidence of any PGR responses with faba bean at Prince Albert in 2025 and the data were too variable overall to be included in any final, combined statistical analyses.

Table 17. Plant growth regulator effects on selected response variables for faba beans at Prince Albert, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight	Seed Protein
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --	----- % -----
Control (UTC)	36 a	67.5 a	3.3 a	114.0 a	3034 a	410 a	28.6 a
Moddus (TXP)	37 a	70.2 a	3.0 a	119.3 a	3511 a	421 a	28.6 a
Manipulator (CC)	30 a	69.9 a	4.0 a	116.0 a	3163 a	402 a	28.7 a
Tank-Mix (MIX)	32 a	67.8 a	3.3 a	115.3 a	3341 a	414 a	28.9 a
S.E.M.	4.5	4.96	0.75	2.3	547.7	8.3	0.35
Pr > F (p-value)	0.500	0.424	0.316	0.375	0.837	0.343	0.904
LSD _{0.05}	ns	ns	ns	ns	ns	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Lentil: Swift Current 2025

For lentil at Swift Current, the PGR treatments were applied 17 days before the onset of flowering (Table 33) and results are in Table 18. Overall establishment was good and uniform, ranging from 121-126

plants/m² with no PGR effect ($P = 0.916$). While not significant ($P = 0.298$), there was a slight trend for shorter plants with PGR (26.4-27.3 cm) relative to the UTC (29.5 cm). No lodging was observed in any plots and there was no variation in maturity amongst plots. The overall average yield was 2695 kg/ha PGR effects detected ($P = 0.986$) and, while somewhat inconsistent, data for this variable was still considered reliable. Thousand seed weights were high and quite consistent with 40.4-41.4 g/1000 seeds across treatments and no significant PGR effects ($P = 0.591$). Overall, lentil data for all response variables from Swift Current in 2025 were of sufficient quality and reliability to be included in any future, combined statistical analyses.

Table 18. Plant growth regulator effects on selected response variables for lentils at Swift Current, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --
Control (UTC)	126 a	29.5 a	0.0	92.0	2769 a	40.7 a
Moddus (TXP)	122 a	27.3 a	0.0	92.0	2691 a	40.7 a
Manipulator (CC)	121 a	26.9 a	0.0	92.0	2652 a	41.4 a
Tank-Mix (MIX)	125 a	26.4 a	0.0	92.0	2667 a	40.4 a
S.E.M.	6.5	1.16	—	—	241.6	0.52
Pr > F (p-value)	0.916	0.298	—	—	0.986	0.591
LSD _{0.05}	ns	ns	—	—	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Lentil: Outlook 2025

For lentil at Outlook in 2025, the PGR treatments were applied 18 days ahead of flowering and results are in Table 19. Mortality was high and establishment somewhat variable, with a range of 76-93 plants/m² observed for individual treatments, but no PGR effect ($P = 0.265$). Unfortunately, the height data were extremely variable, essentially showing opposite the expected trends (i.e., increased height with PGR), but no PGR effect ($P = 0.115$) due to the high variability and inconsistency across replicates. Lodging was severe, ranging from 7.5-8.5 (out of 9), but not affected by PGR ($P = 0.194$). Averaging 2369 kg/ha, lentil seed yields at Outlook were low relative to the other sites in 2025 and not affected by PGR ($P = 0.646$). Thousand seed weights were also quite low at this site; however, the data appeared reliable and there was no PGR effect ($P = 0.403$). Overall, while plant height data for the Outlook 2025 lentils will likely be excluded from future, combined analyses due to high variability and unusual results, there are no major data quality concerns for the remaining response variables.

Table 19. Plant growth regulator effects on selected response variables for lentils under irrigation at Outlook, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight
	--- #/m ² ---	---- cm ----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --
Control (UTC)	93 a	40.4 a	8.5 a	98.0	2492 a	28.4 a
Moddus (TXP)	76 a	47.0 a	8.5 a	98.0	2334 a	28.1 a
Manipulator (CC)	92 a	51.3 a	7.5 a	98.0	2280 a	29.1 a
Tank-Mix (MIX)	90 a	51.4 a	8.0 a	98.0	2369 a	28.4 a
S.E.M.	7.4	3.47	0.52	–	121.3	0.69
Pr > F (p-value)	0.265	0.115	0.194	–	0.646	0.403
LSD _{0.05}	ns	ns	ns	–	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Lentil: Scott 2025

At Scott in 2025, the PGR treatments were applied 19 days prior to flowering and results are in Table 20. With an overall average of 166 plants/m², establishment was excellent and not affected by PGR ($P = 0.393$). Plant heights ranged from 37.0-39.1 cm with a marginally significant overall F-test ($P = 0.076$); however, values in the UTC were intermediate and any evidence of height reductions with PGR was weak, at best. Lodging was always negligible and not affected by PGR ($P = 0.593$). Maturity was also unaffected by PGR ($P = 0.728$) with an overall average of 96 days. Yields were intermediate relative to the other sites with low overall variability, a range of 3095-3172 kg/ha amongst treatments, and no PGR effect ($P = 0.819$) or notable trends observed. Seed weights were also quite high, uniform, and not affected by PGR (38.6-39.3 g/1000 seeds; $P = 0.890$). Overall data quality for lentils at Scott in 2025 was considered excellent for all response variables.

Table 20. Plant growth regulator effects on selected response variables for lentils at Scott, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight
	--- #/m ² ---	---- cm ----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --
Control (UTC)	170 a	38.4 a	0.0 a	96.5 a	3116 a	39.3 a
Moddus (TXP)	155 a	37.0 a	0.3 a	94.5 a	3095 a	38.6 a
Manipulator (CC)	162 a	39.1 a	0.0 a	96.3 a	3193 a	38.9 a
Tank-Mix (MIX)	177 a	37.5 a	0.3 a	95.5 a	3172 a	39.0 a
S.E.M.	11.9	0.59	0.18	1.51	102.3	0.64
Pr > F (p-value)	0.393	0.076	0.593	0.728	0.819	0.890
LSD _{0.05}	ns	ns	ns	ns	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Lentil: Indian Head 2025

The PGR treatments for lentil at Indian Head were applied 12 days prior to the flowering and results are in Table 21. Establishment was excellent and quite uniform with an average of 173 plants/m² and no effect of PGR ($P = 0.625$). There was a slight trend for shorter plants with PGR; however, the magnitude of the response was small, and the effect was not significant at the desired probability ($P = 0.093$). While minor

lodging was observed with an overall score of 2.2/9, it was not affected by PGR ($P = 0.808$). Maturity was reached in 95 days on average and was also consistent across PGR treatments ($P = 0.646$) and the trial area. Lentil seed yields were exceptionally high at this site and background variability was low; however, there were no PGR effects ($P = 0.655$) or noteworthy trends with 4642-4800 kg/ha across treatments and intermediate values in the UTC. Thousand seed weights were also reasonably high and very consistent across PGR treatments (39.3-40.0 g/1000 seeds; $P = 0.203$). Despite the lack of any treatment effects, overall data quality for this site was considered excellent for all response variables.

Table 21. Plant growth regulator effects on selected response variables for lentils at Indian Head, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density --- #/m ² ---	Plant Height ----- cm -----	Lodging Score ---- 0-9 ----	Days to Maturity ---- days ----	Grain Yield --- kg/ha ---	Seed Weight -- g/1000 --
Control (UTC)	174 a	42.6 a	2.0 a	94.5 a	4739 a	40.0 a
Moddus (TXP)	162 a	40.5 a	2.3 a	94.5 a	4642 a	39.4 a
Manipulator (CC)	182 a	39.9 a	2.3 a	95.0 a	4800 a	39.6 a
Tank-Mix (MIX)	172 a	41.2 a	2.3 a	95.0 a	4726 a	39.3 a
S.E.M.	9.9	0.38	0.22	0.35	100.9	0.21
Pr > F (p-value)	0.625	0.093	0.808	0.646	0.655	0.203
LSD _{0.05}	ns	ns	ns	ns	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Lentils: Melfort 2025

For lentils at Melfort in 2025, PGR treatments were applied 8 days prior to the beginning of flowering and results are in Table 22. With an overall mean of 115 plants/m², mortality was relatively high and quite variable; however, there was no PGR effect ($P = 0.630$) and densities were never so low to be likely to limit yields or adversely affect data quality. A significant PGR effect for plant height ($P = 0.028$) revealed that all three treatments (36.2-37.5 cm) reduced heights slightly, but significantly, when compared to the UTC (39.8 cm). Lodging was negligible for all treatments (1.0-1.5/9) and not affected by PGR ($P = 0.929$). Maturity was consistent across the trial area, averaging 91 days from seeding with no PGR effect ($P = 0.529$). Lentil yields were intermediate at this site, but quite uniform across individual treatments (2906-2969 kg/ha) with no significant PGR effects ($P = 0.937$) or meaningful trends. The PGR effects on seed size were significant ($P = 0.047$), albeit small, showing positive responses to both TXP and CC (38.5-38.7 g/1000 seeds) relative to the control (37.6 g/1000 seeds). Seed weights were highly consistent at this site, and it is possible that this response will disappear in future combined analyses. Overall, despite higher than ideal seedling mortality, lentil response data for all variables at Melfort 2025 was of excellent quality.

Table 22. Plant growth regulator effects on selected response variables for lentils at Melfort, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --
Control (UTC)	104 a	39.8 a	1.0 a	91.8 a	2991 a	37.6 c
Moddus (TXP)	122 a	37.5 b	1.3 a	92.0 a	2969 a	38.5 ab
Manipulator (CC)	111 a	36.2 b	1.5 a	90.8 a	2906 a	38.7 a
Tank-Mix (MIX)	121 a	36.7 b	1.5 a	91.0 a	2940 a	37.8 bc
S.E.M.	12.0	0.71	0.72	0.67	128.7	0.26
Pr > F (p-value)	0.630	0.028	0.929	0.529	0.937	0.047
LSD _{0.05}	ns	2.29	ns	ns	ns	0.82

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Lentil: Prince Albert 2025

For lentil at Prince Albert, the PGR treatments were applied 18 days prior to flowering and results are in Table 23. Establishment was excellent and quite uniform in terms of treatment means (157-165 plants/m²; $P = 0.978$) but highly variable across the trial area. Plant heights were not affected by PGR ($P = 0.464$) and nor was lodging ($P = 0.573$), despite the latter being quite severe. Maturities were variable overall, but reasonably consistent across treatments (94.5-96.3 days) with no PGR effect ($P = 0.877$). Lentil yields were quite high on average but extremely variable with a range of 3727-4157 kg/ha for individual treatments and standard error value 13.5% of the overall mean. Data for seed weights was quite consistent with absolute values that were intermediate relative to the other sites (35.8 g/1000 seeds) but no PGR effect ($P = 0.626$). While the lentil data from Prince Albert 2025 for grain yield and, potentially, maturity will be excluded from future combined analyses, there are no specific concerns with the remaining data.

Table 23. Plant growth regulator effects on selected response variables for lentils at Prince Albert, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --
Control (UTC)	160 a	43.8 a	6.3 a	95.8 a	3893 a	35.8 a
Moddus (TXP)	162 a	44.3 a	6.5 a	96.3 a	3727 a	35.8 a
Manipulator (CC)	165 a	44.9 a	6.5 a	94.5 a	4157 a	36.0 a
Tank-Mix (MIX)	157 a	41.9 a	7.0 a	95.8 a	3919 a	35.5 a
S.E.M.	15.7	1.61	0.97	2.67	533.2	0.30
Pr > F (p-value)	0.978	0.464	0.573	0.877	0.577	0.626
LSD _{0.05}	ns	ns	ns	ns	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Field Pea: Swift Current 2025

The PGR treatments for field pea at Swift Current were applied 20 days prior to flowering (Table 34) and results are in Table 24. Overall establishment was excellent, albeit somewhat variable across the trial, and not affected by PGR ($P = 0.985$). The plants were inherently short at this site and not affected by PGR ($P = 0.870$) with a range of 44.3-45.8 cm and intermediate values with the UTC. No lodging was observed in any

plots and maturity was also consistent both across PGR treatments and the trial area (107.3-108.0 days; $P = 0.775$). Averaging 2414 kg/ha, pea yields at Swift Current in 2025 were relatively low and slightly variable; however, the data were considered reliable overall and no PGR effects were detected ($P = 0.702$). Seed weights were more intermediate and quite consistent, averaging 222 g/1000 seeds with no PGR effect ($P = 0.877$). Protein concentrations ranged from 17.2-18.4% and were also unaffected by PGR ($P = 0.282$). Overall, data for all variables for field pea at Swift Current in 2025 were of sufficiently high quality to be included in any combined, final statistical analyses.

Table 24. Plant growth regulator effects on selected response variables for field peas at Swift Current, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher’s protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight	Seed Protein
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --	----- % -----
Control (UTC)	105 a	44.9 a	0.0	107.5 a	2453 a	221 a	17.2 a
Moddus (TXP)	104 a	44.3 a	0.0	108.0 a	2476 a	225 a	18.3 a
Manipulator (CC)	107 a	44.3 a	0.0	107.3 a	2235 a	221 a	17.7 a
Tank-Mix (MIX)	106 a	45.8 a	0.0	107.5 a	2493 a	220 a	18.4 a
S.E.M.	5.2	2.10	–	0.52	173.7	4.6	0.52
Pr > F (p-value)	0.985	0.870	–	0.775	0.702	0.877	0.282
LSD _{0.05}	ns	ns	–	ns	ns	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Field Peas: Outlook 2025

For the field peas at Outlook in 2025, PGR treatments were applied 18 days prior to flowering and results are in Table 25 below. Establishment was somewhat variable, but good overall with 72-85 plants/m² for individual treatments and no effect of PGR ($P = 0.267$). Plant heights at this location were variable and, as such, the overall PGR effect was not significant ($P = 0.671$) despite a trend for shorter plants with PGR. Minor lodging was observed with an overall average rating of 2.6/9, but lodging was not affected by PGR ($P = 0.909$). No variation in maturity was observed with all plots declared physiologically mature 94 days after seeding. Yields were intermediate relative to the other locations and quite uniform, with a range of 3712-3875 kg/ha, but no PGR effect ($P = 0.299$). Seed weights were unusually low and variable relative to the other sites with, despite a range of 158-173 g/1000 seeds amongst treatments, no PGR effect detected ($P = 0.324$). The PGR effect on protein was not significant ($P = 0.113$); however, there was a slight trend for higher protein in the MIX treatment (22.0%) relative to the UTC (21.1%) and intermediate values for the remaining PGR treatments. Overall, field pea data from this site was generally considered reliable and fit for combined analyses apart from the unusually low and variable seed weights.

Table 25. Plant growth regulator effects on selected response variables for field peas under irrigation at Outlook, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher’s protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight	Seed Protein
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --	----- % -----
Control (UTC)	85 a	72.4 a	2.3 a	94.0	3777 a	158 a	21.1 a
Moddus (TXP)	72 a	67.6 a	2.3 a	94.0	3748 a	170 a	21.4 a
Manipulator (CC)	74 a	69.4 a	2.8 a	94.0	3712 a	173 a	21.5 a
Tank-Mix (MIX)	84 a	70.0 a	3.0 a	94.0	3875 a	158 a	22.0 a
S.E.M.	5.4	4.28	1.02	–	58.8	7.0	0.53
Pr > F (p-value)	0.267	0.671	0.909	–	0.299	0.324	0.113
LSD _{0.05}	ns	ns	ns	–	ns	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Field Pea: Scott 2025

For field peas at Scott, the PGR treatments were applied 16 days prior to the start of flowering and results are in Table 26. Establishment was excellent and reasonably uniform with 89-96 plants/m² and no significant PGR effect ($P = 0.659$). The data for plant heights was consistent with no PGR effect ($P = 0.200$), a range of 66-69 cm, and no trends to suggest even minor height reductions with PGR since heights in the UTC were intermediate. Lodging was negligible and not affected by PGR ($P = 0.436$) while maturity was reached 93 days after seeding on average with no PGR effect ($P = 0.394$). Yields were high and quite consistent with a range of 4422-4499 kg/ha across treatments ($P = 0.814$) and relatively low standard error values. Seed weights were also high, consistent, and unaffected by PGR (259-261 g/1000 seeds; $P = 0.731$) and the same was true for seed protein concentrations (23.3-23.5%; $P = 0.427$). Overall, despite no significant responses to PGR, data quality for field peas at Scott in 2025 were considered excellent for all response variables.

Table 26. Plant growth regulator effects on selected response variables for field peas at Scott, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher’s protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight	Seed Protein
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --	----- % -----
Control (UTC)	96 a	67.9 a	0.3 a	93.8 a	4422 a	261 a	23.3 a
Moddus (TXP)	89 a	66.3 a	0.0 a	93.3 a	4499 a	259 a	23.5 a
Manipulator (CC)	91 a	69.2 a	0.3 a	92.8 a	4437 a	259 a	23.3 a
Tank-Mix (MIX)	93 a	67.3 a	0.0 a	92.5 a	4483 a	259 a	23.4 a
S.E.M.	3.9	0.90	0.18	0.53	75.1	2.1	0.16
Pr > F (p-value)	0.659	0.200	0.436	0.394	0.814	0.731	0.427
LSD _{0.05}	ns	ns	ns	ns	ns	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Field Pea: Indian Head 2025

For field pea at Indian Head, the PGR treatments were applied 15 days prior to flowering and results are in Table 27. Establishment was good overall with 85 plants/m² on average and no PGR effects ($P = 0.453$). While the response was small, the treatment effect was significant ($P = 0.004$) and PGR consistently reduced field pea heights at this site. The MIX treatments (71.7 cm) provided the greatest reduction while more intermediate results were achieved with TXP and CC alone (73.2-73.9 cm); however, all significantly reduced height relative to the UTC (76.6 cm). Lodging was minor with an average score of 1.3/9 and, despite the observed height reductions, not affected by PGR ($P = 0.773$). Overall yields were excellent and highly consistent with a range of 5592-5716 kg/ha and no PGR effect ($P = 0.247$). Seed weights were intermediate relative to the other sites but not affected by PGR ($P = 0.316$) with a range of 231-234 g/1000 seeds amongst individual treatments. The same was true for protein which ranged from 19.9-20.1% ($P = 0.561$). Overall, data quality for all variables for field peas at Indian Head in 2025 was considered excellent.

Table 27. Plant growth regulator effects on selected response variables for field peas at Indian Head, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight	Seed Protein
	--- #/m ² ---	---- cm ----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --	---- % ----
Control (UTC)	84 a	76.6 a	1.3 a	95.4 a	5716 a	232 a	19.9 a
Moddus (TXP)	85 a	73.2 bc	1.4 a	95.4 a	5672 a	234 a	20.1 a
Manipulator (CC)	82 a	73.9 b	1.3 a	95.8 a	5708 a	232 a	19.9 a
Tank-Mix (MIX)	89 a	71.7 c	1.1 a	95.0 a	5592 a	231 a	20.1 a
S.E.M.	4.1	0.94	0.17	0.18	79.1	1.0	0.15
Pr > F (p-value)	0.453	0.004	0.773	0.068	0.247	0.316	0.561
LSD _{0.05}	ns	2.13	ns	ns	ns	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Field Pea: Yorkton 2025

At Yorkton in 2025, the PGR treatments were applied 20 days prior to flowering for field peas and results are in Table 28. Establishment was excellent overall, averaging 99 plants/m²; however, the treatment effect was significant ($P = 0.002$), revealing higher plant populations in the UTC. This was unexpected and considered random since the counts were completed prior to the treatment applications. Again, PGR effects will be excluded from the final combined analyses for emergence data to prevent such results from distracting from the more important overall site effects on establishment and stand uniformity. The PGR effect on plant height was not significant at the desired probability ($P = 0.119$); however, there was a trend for shorter plants with the TXP and MIX treatments (55 cm), when compared to the UTC (61 cm). Lodging was minor for all plots, averaging 0.7/9 overall. Despite a significant treatment effect ($P = 0.050$) for lodging, no PGR treatments significantly differed from the UTC. Seed yields were intermediate relative to other sites but not affected by PGR ($P = 0.278$) despite a slight trend for higher yields in the UTC. Seed weights at Yorkton in 2025 were the highest of all sites (266 g/1000 seeds) with low overall variability and no significant PGR treatment effects ($P = 0.628$). Overall, data quality was high for all response variables for the field peas at Yorkton in 2025 with no concerns about carrying it forward to the final, combined analyses.

Table 28. Plant growth regulator effects on selected response variables for field peas at Yorkton, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight	Seed Protein
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --	----- % -----
Control (UTC)	112 a	60.8 a	0.5 ab	82.8 a	3584 a	265 a	18.1 a
Moddus (TXP)	95 b	55.3 a	0.3 b	81.3 b	3268 a	265 a	17.1 a
Manipulator (CC)	90 b	58.3 a	1.0 a	82.5 a	3338 a	269 a	18.3 a
Tank-Mix (MIX)	98 b	55.3 a	1.0 a	82.8 a	3449 a	265 a	18.2 a
S.E.M.	2.9	1.80	0.19	0.63	110.3	2.4	0.64
Pr > F (p-value)	0.002	0.119	0.050	0.023	0.278	0.628	0.324
LSD _{0.05}	9.38	ns	0.61	1.01	ns	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Field Pea: Melfort 2025

For field pea at Melfort in 2025, the PGR treatments were applied 17 days prior to flowering and results are in Table 29. Establishment was somewhat variable with plant densities slightly less than optimal (74 plants/m²), but never to the extent that it might adversely affect the trial and there was no PGR effect ($P = 0.544$). The overall PGR effect on plant height was significant ($P = 0.006$), revealing a reduction with both TXP and the MIX treatments (63-66 cm) relative to the UTC (73 cm). Mean plant height with CC was intermediate (70 cm) and did not differ from the UTC or TXP while the greatest reduction was achieved with the MIX treatment. Lodging was substantial, averaging 5.5/9, but not affected by PGR ($P = 0.882$). Maturity was reached approximately 90 days from seeding and not affected by PGR ($P = 0.456$). Yields were high, but quite variable and, as such, the treatment effect was not significant ($P = 0.241$); however, numerically there was a trend for higher yields in the UTC. The importance of this observation may change with future, more powerful statistical analyses. Neither seed weights ($P = 0.616$) nor protein concentrations ($P = 0.115$) were affected by PGR and data quality for both variables was high. Overall, there were no major concerns with respect to data quality for field peas at Melfort in 2025 and all data from this site will be included in the final, combined analyses.

Table 29. Plant growth regulator effects on selected response variables for field peas at Melfort, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight	Seed Protein
	--- #/m ² ---	----- cm -----	---- 0-9 ----	---- days ----	--- kg/ha ---	-- g/1000 --	----- % -----
Control (UTC)	71 a	73.1 a	4.8 a	90.5 a	4624 a	236 a	22.3 a
Moddus (TXP)	69 a	66.3 bc	5.8 a	90.0 a	4278 a	237 a	22.7 a
Manipulator (CC)	74 a	69.8 ab	5.5 a	91.0 a	4345 a	239 a	22.8 a
Tank-Mix (MIX)	81 a	63.4 c	6.0 a	89.5 a	4253 a	240 a	22.9 a
S.E.M.	6.0	1.47	1.16	0.456	250.4	2.3	0.33
Pr > F (p-value)	0.544	0.006	0.882	0.185	0.241	0.616	0.115
LSD _{0.05}	ns	4.70	ns	ns	ns	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

Field Peas: Prince Albert 2025

For field peas at Prince Albert, the PGR treatments were applied 18 days prior to flowering and results are in Table 30. Overall seedling mortality was relatively high at this site and establishment variable, with no significant PGR effect ($P = 0.641$) despite a range of 48-60 plants/m² for individual treatments. Plant heights were also variable and, as such, no differences between treatments could be considered significant ($P = 0.520$), even though, numerically, the plants were taller in the UTC (71 cm) than all treatments that received PGR (66-67 cm). Moderate lodging was observed with an overall average score of 3.4/9; however, the PGR effect was not significant ($P = 0.472$) and values in the UTC were intermediate. Maturity was reached an average of 92 days after seeding with no PGR effect ($P = 0.155$), despite variation across treatments and the trial area. Yields were severely diminished due to deer feeding with an overall average of only 414 kg/ha harvested and no PGR effect ($P = 0.080$). Seed weights were intermediate relative to the other sites (231 g/1000 seeds), but also quite variable and not affected by PGR ($P = 0.641$), despite a range of 225-237 g/1000 seeds. Protein concentrations averaged 26% and the data were more consistent; however, no PGR effects were detected. Due to the deer damage that occurred late in the season and uncertainty how this may have affected the quality of the harvest samples, yields, seed weights, and protein concentrations from the field peas at Prince Albert in 2025 will be excluded from any final, combined analyses.

Table 30. Plant growth regulator effects on selected response variables for field peas at Prince Albert, 2025. Data were analyzed using the generalized linear mixed model procedure of SAS Studio. Values denoted by the same letter do not significantly differ (Fisher's protected LSD test, $P \leq 0.05$).

Treatment ^z	Plant Density	Plant Height	Lodging Score	Days to Maturity	Grain Yield	Seed Weight	Seed Protein
	--- #/m ² ---	----- cm -----	---- 0-9 ----	--- days ---	--- kg/ha ---	-- g/1000 --	----- % -----
Control (UTC)	60 a	71.3 a	3.5 a	91.0 a	363 a	231 a	25.5 a
Moddus (TXP)	54 a	67.3 a	2.0 a	92.5 a	500 a	237 a	26.2 a
Manipulator (CC)	48 a	67.3 a	4.0 a	92.0 a	388 a	232 a	26.0 a
Tank-Mix (MIX)	57 a	66.1 a	4.0 a	90.5 a	405 a	225 a	26.0 a
S.E.M.	6.8	3.43	0.99	0.61	47.9	6.0	0.35
Pr > F (p-value)	0.641	0.520	0.472	0.155	0.080	0.641	0.544
LSD _{0.05}	ns	ns	ns	ns	ns	ns	ns

^z PGR treatments applied at the 8-10 node stage in a minimum solution volume of 93 l/ha. Moddus is 125 g trinexapac-ethyl/ha. Manipulator is 1426 g chlormequat chloride/ha. Tank-mix is 62.5 g trinexapac-ethyl/ha plus 713 g chlormequat chloride/ha.

9. Economic and Practical Implications for Growers

Detailed economic analyses were beyond the scope of this project since marginal profits will vary widely depending on the assumptions used for seed prices. Costs of the plant growth regulator (PGR) applications may also vary from farm to farm. If we assume product costs of \$48.50/L for Moddus and \$20.00/L for Manipulator 620, the costs in the current trial would be an estimated \$50/ha for TXP, \$46/ha for CC, and \$48/ha for MIX (\$19-20/ac), plus the cost of application (17-35/ha or \$7-14/ac). Due to the likelihood of the optimal PGR timing being after that for herbicide but prior to that for fungicide, it is probable that a separate pass would be required. For cereal crops, the value attributed to PGR often goes beyond yield to include improvements in harvest efficiency and, potentially, even grain quality if the PGR prevents severe lodging. If we were to see measurable improvements in standability, this could also be true for pulse crops. With all this in mind, producers would need to find a value of \$65-85/ha (\$26-34/ac) through yield, quality, or efficiency gains to simply cover the cost of a PGR application, depending on the specific product and application costs.

All that said, results to date suggest that PGR only affected height at 1/5 chickpea sites, 1/6 faba bean sites, 1/6 lentil sites, and 2/6 field pea sites. Lodging was only reduced in 1/23 possible cases and significant effects on yield only occurred in 2/23 possible cases, with one positive yield response and one negative. While all results are preliminary at this stage and our conclusion may be change with additional data and more powerful statistical analyses, results to date suggest that PGR are relatively unlikely to provide meaningful economic or agronomic benefits to growers of the major pulse crop options in Saskatchewan.

10. Conclusions & Recommendations (how do results relate to objectives or original research that project is based on; is there a need to refine current recommendation based on the results of this project?)

In conclusion, our results to date suggest that meaningful benefits to plant growth regulator (PGR) in chickpea, faba bean, lentil, and field pea are relatively unlikely; however, no concrete conclusions will be drawn until we have all the data and have conducted more sophisticated statistical analyses. Importantly, the work is purely exploratory in nature and farmers are currently prohibited from using these products in commercial grain production of the crops being evaluated.

Pulse growers who wish to reduce lodging and improve harvestability of these crops will have to rely on other means to do so. These strategies might include variety selection, optimum seeding practices (i.e., seeding date and rate), balanced but not excessive fertility, managing disease (i.e., fungicide applications), and timely harvest (potentially assisted by harvest aids where permissible) to keep their crops standing as well as possible and reduce the potential for harvest challenges or loss of seed quality associated with crop lodging and harvest delays.

11. Future Research (did the project identify a need for future research or further work)

Because this project is in progress, there are currently no recommendations for future research. If, upon the projects conclusion, we see sufficient merit to justify further exploration, there will likely be questions on optimal application timing and rates. Further field testing would likely be required to acquire product registration and maximum residue limits (MRL) for the harvested grain may need to be established. With all that in place, we will need to ensure that the buyers of these crops will accept seed that has been treated with the products in question. If the treatments evaluated do not provide sufficient benefits to justify further exploration or seeking registration, there may be value to exploring other products such as ethylene-releasing compounds or prohexadione-based PGRs that might provide the intended benefits.

12. Technology Transfer Activities (include presentations, extension material, field days, articles published, etc.)

During the 2025 growing seasons, these trials were highlighted during the WARC field day at Scott (July 9, 2025; 120 attendees) and at the AAFC/NARF minor/niche crop tour at Melfort (July 24, 2025; 36 attendees), where Mike Brown (SaskPulse) presented on the topic. Additionally, Chris Holzapfel presented a complete summary of preliminary results during the Southey Winter Pulse Meeting (February 3, 2026; 40 attendees) while Amber Wall highlighted the project during the Swift Current Winter Pulse Meeting (February 4, 2026; 100 attendees), both of which were hosted by SaskPulse. Koralie Mack presented preliminary results at the WARC Crop Opportunity meeting on March 12, 2026 (80 attendees) and Chris Holzapfel presented during the Home-Grown Research: SK Agri-ARM Network Update webinar (March 24, 2026; 189 live attendees). This preliminary technical report will be available online through IHARF and AgriARM websites and we will continue to incorporate results highlights into future presentations where appropriate opportunities arise. Additionally, SaskPulse will incorporate pertinent results into their own extension material upon conclusion of the project.

13. Funding Contributions (acknowledge partners and contributors to the project)

Financial support for this demonstration was provided by the Saskatchewan Pulse Crop Development Board (SaskPulse). Signs were in-place for any plot tours to acknowledge the funding sources and appropriate acknowledgements made in all written communications, oral presentations, or other printed materials pertaining to the project. We would like to acknowledge the Boards of Directors for the participating organizations in addition to the many technical and support staff who worked on the project. Many of the inputs and crop protection products utilized, including those being evaluated, were provided as in-kind donations. IHARF, NARF, WARC, and WCA have strong working relationships and memorandum of understanding with Agriculture and Agri-Food Canada that should be acknowledge. Each of the participating organizations have received funding for infrastructure and basic operating expenses from the Saskatchewan Ministry of Agriculture and several other producer/commodity groups, all of which has helped to make work like this possible.

14. Appendices (detailed data tables, maps, photos, etc.)

Table 31. Selected agronomic information and dates of operations / key crop stages for SaskPulse plant growth regulator (PGR) trials with chickpea.

Site	Fertilizer	Inoculant	Seeding Date	Plant Density	PGR Appl.	Flower Date	Plant Height	Lodging Score	Harvest Date
	kg N-P ₂ O ₅ -K ₂ O-S/ha	kg product/ha	----- Julian Date -----						
SW-25	12-56-0-0	5.6 kg/ha TagTeam BioniQ	133	167	163	183	239	239	266
OL-25	3-15-0-0	5.9 kg/ha PRIMO GX2	147	169	178	196	211	262	297
SC-25	4-17-0-0	4.0 kg/ha TagTeam BioniQ	127	168	162	180	218	227	266
IH-25	25-35-18-18	3.0 kg/ha TagTeam BioniQ	127	162	171	184	224	254	269
ME-25	14-28-0-9	4.0 kg/ha PRIMO GX2	140	153	171	186	279	295	297

Table 32. Selected agronomic information and dates of operations / key crop stages for SaskPulse plant growth regulator (PGR) trials with faba bean.

Site	Fertilizer	Inoculant	Seeding Date	Plant Density	PGR Appl.	Flower Date	Plant Height	Lodging Score	Harvest Date
	kg N-P ₂ O ₅ -K ₂ O-S/ha	kg product/ha	----- Julian Date -----						
OL-25	3-15-0-0	5.9 kg/ha PRIMO GX2	147	169	178	199	211	253	280
SC-25	4-17-0-0	3.7 kg/ha TagTeam	127	168	175	182	218	227	252
IH-25	28-40-20-20	3 kg/ha Nodulator Duo SCG	127	161	171	183	224	240	252
YK-25	7-34-0-0	4 kg/ha PRIMO GX2	132	153	163	182	217	245	254
ME-25	12-56-0-0	2.5 kg/ha LALFIX Spherical	129	153	182	188	224	275	275
PA-25	7-33-0-0	4.8 kg/ha PRIMO GX2	133	185	171	189	223	274	274

Table 33. Selected agronomic information and dates of operations / key crop stages for SaskPulse plant growth regulator (PGR) trials with lentil.

Site	Fertilizer	Inoculant	Seeding Date	Plant Density	PGR Appl.	Flower Date	Plant Height	Lodging Score	Harvest Date
	kg N-P ₂ O ₅ -K ₂ O-S/ha	kg product/ha	----- Julian Date -----						
SW-25	12-56-0-0	5.6 kg/ha TagTeam BioniQ	133	167	163	180	239	239	251
OL-25	3-15-0-0	5.9 kg/ha PRIMO GX2	147	169	178	196	210	253	294
SC-25	4-17-0-0	3.7 kg/ha Cell Tech	127	168	162	181	218	223	237
IH-25	28-40-20-20	3 kg/ha Nodulator Duo SCG	127	155	171	183	205	223	237
ME-25	15-31-0-9	2.5 kg/ha Lalfix Spherical	142	153	182	190	233	267	267
PA-25	6-28-0-0	4.8 kg/ha PRIMO GX2	133	160	171	189	220	251	252

Table 34. Selected agronomic information and dates of operations / key crop stages for SaskPulse plant growth regulator (PGR) trials with field pea.

Site	Fertilizer	Inoculant	Seeding Date	Plant Density	PGR Appl.	Flower Date	Plant Height	Lodging Score	Harvest Date
	kg N-P ₂ O ₅ -K ₂ O-S/ha	kg product/ha	----- Julian Date -----						
SW-25	12-56-0-0	5.6 kg/ha TagTeam BioniQ	133	167	163	183	239	239	254
OL-25	3-15-0-0	5.9 kg/ha PRIMO GX2	147	169	178	196	211	253	274
SC-25	4-17-0-0	3.7 kg/ha Cell Tech	127	168	167	183	218	223	237
IH-25	28-40-20-20	3 kg/ha Nodulator Duo SCG	127	155	171	186	205	223	231
YK-25	7-34-0-0	4 kg/ha PRIMO GX2	132	153	163	183	217	217	232
ME-25	10-47-0-0	2.5 kg/ha Lalfix Spherical	129	153	171	188	206	231	231
PA-25	8-36-0-0	5.4 kg/ha PRIMO GX2	133	160	171	189	220	248	248

Table 35. Mean monthly temperatures and long-term (LT; 1981-2010) averages for the 2025-26 growing seasons at Swift Current (SW), Outlook (OL), Scott (SC), Indian Head (IH), Yorkton (YK), Melfort (ME), and Prince Albert (PA), Saskatchewan.

Location	Year	May	Jun	Jul	Aug	Sep ^z	Average ^z
----- Mean Temperature (°C) -----							
Swift Current	2025	13.1	15.9	18.0	19.0	16.7	16.5 (+0.7)
	2026	–	–	–	–	–	–
	LT	10.9	15.4	18.5	18.2	12.0	15.8
Outlook	2025	13.6	16.2	17.4	19.0	16.0	16.6 (+0.5)
	2026	–	–	–	–	–	–
	LT	11.5	16.1	18.9	18.0	12.3	16.1
Scott	2025	12.9	14.6	15.8	17.4	14.7	15.2 (+0.3)
	2026	–	–	–	–	–	–
	LT	10.8	15.3	17.1	16.5	10.4	14.9
Indian Head	2025	12.7	15.3	17.0	17.8	15.3	15.7 (+0.1)
	2026	–	–	–	–	–	–
	LT	10.8	15.8	18.2	17.4	11.5	15.6
Yorkton	2025	12.4	15.7	17.5	18.3	15.0	16.0 (+0.8)
	2026	–	–	–	–	–	–
	LT	10.4	15.5	17.9	17.1	11.1	15.2
Melfort	2025	13.8	15.0	17.0	18.0	15.0	16.0 (+0.8)
	2026	–	–	–	–	–	–
	LT	10.7	15.9	17.5	16.8	10.8	15.2
Prince Albert	2025	11.2	12.7	14.9	17.1	13.9	14.0 (-0.9)
	2026	–	–	–	–	–	–
	LT	10.4	15.3	18.0	16.7	10.5	15.1

^z Growing season averages are for the 4-month May-August period; however, September data is also presented for potential relevance to long-season crops like faba bean and chickpea

Table 36. Monthly precipitation totals and long-term (LT; 1981-2010) averages for the 2025-26 growing seasons at Swift Current (SW), Outlook (OL), Scott (SC), Indian Head (IH), Yorkton (YK), Melfort (ME), and Prince Albert (PA), Saskatchewan.

Location	Year	May	Jun	Jul	Aug	Sep ^z	Total ^z
----- Total Precipitation (mm) -----							
Swift Current	2025	34.2	31.3	78.2	92.6	0.8	236 (110%)
	2026	–	–	–	–	–	–
	LT	48.5	72.8	52.6	41.5	34.1	215
Outlook ^y	2025	6.2	83.1 (70)	59.4 (67)	60.9	3.9	210 (102%)
	2026	–	–	–	–	–	–
	LT	42.6	63.9	56.1	42.8	34.1	205
Scott	2025	11.8	103.7	28.7	64.5	0.7	209 (98%)
	2026	–	–	–	–	–	–
	LT	36.3	61.8	72.1	45.7	36.0	216
Indian Head	2025	42.6	39.4	27.1	26.9	43.1	136 (56%)
	2026	–	–	–	–	–	–
	LT	51.7	77.4	63.8	51.2	35.3	244
Yorkton	2025	23.6	63.4	36.8	71.2	37.3	195 (72%)
	2026	–	–	–	–	–	–
	LT	51.3	80.1	78.2	62.2	44.9	272
Melfort	2025	4.8	93.2	25.9	113.5	20.3	237 (105%)
	2026	–	–	–	–	–	–
	LT	42.9	54.3	76.7	52.4	38.7	226
Prince Albert	2025	2.2	137.6	8.6	51.2	3.8	200 (79%)
	2026	–	–	–	–	–	–
	LT	44.7	68.6	76.6	61.6	43.4	252

^z Growing season averages are for the 4-month May-August period; however, September data is also presented for potential relevance to long-season crops like faba bean and chickpea

^y Values in parentheses are irrigation totals for the corresponding month