Washington Oilseeds Commission Research Report for 2020-021

New Project Proposal: Yes **Proposed Duration: 1 year**

Project Title: Elucidating the effects of Plant Growth Regulator (PGR) application to winter canola.

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Cooperators: Alan Wernsing, Biological Technician, OSU, Pendleton, OR; Brian Caldbeck, Rubisco Seed, Philpot, KY

Year Initiated 2021 **Current Year:** 2021 **Terminating Year:** 2021

Total Project Requested $10,250

Other Funding Sources: Brian Caldbeck, Rubisco Seed

Description: The goal of this project is to understand and determine the effects of applying plant growth regulators (PGR) to winter canola sown in early September. Winter canola sown in late August or early September can establish and develop to large winter rosettes before the onset of cold conditions. If extremely cold conditions during late autumn or winter, large plant size increases the risk of cold or frost-kill. One option to limit plant size is to apply PGRs, which control cell elongation and reduce plant size. Reduction in plant size lowers the growing point making the plant less susceptible to frost-kill. In addition, PGR can lower soil water use, reduce mature plant height and lessen lodging. In this project, four lines of winter canola will receive two different PRG to study the effect on crop survivability, crop height, lodging reduction, yield and oil content. The outcome of this project will be improved understanding and better recommendations on the use of PGRs on fall-planted canola.

Justification and Background:

Canola is most tolerant to freezing temperature in the rosette growth stage. At this stage, the crown develops at the soil surface with larger, older leaves at the base and smaller, newer leaves at the center. Winter canola sown relatively early in the fall, especially if temperatures are above average can develop significant top growth (Chen et al. 2005). Canola that has more top growth than desirable can more easily succumb to winter-kill for a several reasons, including excess use of available soil water and nutrients, stem elongation and elevation of the growing point far above the soil surface, and increased physical damage to freezing of large, exposed crowns.

A cultural practice that can help manage top growth on fall-planted canola is application of growth-inhibiting PGRs. While there are at least six classes of PGR, the growth inhibiting types provide the best method to reduce growth at the proper time to aid in better cold tolerance of winter canola. Application of this class of PGRs is commonly practiced in European Union

countries (Yared Assefa et al. 2018). Work conducted in the Southern Great Plains has shown that shown that PGR can affect plant height but may not increase yield, oil content or protein level (McCauley et al. 2016).

This study will evaluate two growth inhibiting PGR, MEPEX (mepiquat chloride) and Shortstop 2SC (Paclobutrazol) on four cultivars of winter canola, CC17066, Hekip, Mercedes, and Amanda. Mepex acts by inhibiting cell elongation and aids in uniformity of maturity. Shortstop acts by reducing internodal length, inhibiting growth and increasing plant thickness. In order of crop maturity, CCC27066 is earliest, Hekip and Amanda have mid-maturity and Mercedes the latest maturity. Having cultivars that cover the maturity range will provide information different growth habits. There is also difference in seed emergence in these cultivars, with Mercedes and Hekip having more rapid emergence (2-3 days).

Objectives:

1. Apply the PGRs, Mepex and Shortstop 2SC to CC17066, Hekip, Mercedes, and Amanda winter canola cultivars at recommended label rates and evaluate winter-survival, stem thickness, plant height, yield, and oil and protein content.
2. Develop recommendations for use of PGRs on early-planted canola

Methodology:

A randomized split block (strip plot) experiment with 12 treatments and 4 replications was seeded on 10 September 2020. Main plot treatments are 4 canola cultivars, CC17066, Hekip, Mercedes, and Amanda. Subplot treatments are: 1. Control (Toledo fungicide @ 4 fl oz (ai tebeuconazole)/acre), 2. MEPEX (96 fl oz (ai mepiquat chloride) /acre,) + Toledo, and 3. Shortstop 2SC (3.56 fl oz (ai Paclobutrasol) /acre,) + Toledo. Treatments were determined through consultation with Brian Caldbeck of Rubisco Seed. Rubisco seed contributed the two PGRs, fungicide and seed for the cultivars, CC17066, Hekip, and Mercedes. Targeted application of the PGR was at the 4-leaf stage.

The experiment was sown on tilled summer fallow at the Columbia Basin Agricultural Research Center, Pendleton, Oregon on a Walla Walla silt loam, coarse loamy, mixed, mesic, hyperactive Typic Haploxeroll. Fertility rates were 200 lb/acre of dry 33-7-0-7 broadcast and incorporated, which is respectively 66 lb N, 14 lb P2O5 and 14 lb S per acre. Topdress N will be applied in late winter at a rate to be determined by spring soil test and measured tissue N. Canola lines were sown at 8 seed/ft^2, based on specific seed counts per pound. Seed packets were prepared by weighing the appropriate amount for each cultivar, based on subplot area. Plots were sown with a 5-foot wide Hege plot drill, using 6-inch row spacing, JD double disk openers and press type packer wheels. Individual subplots have a dimension of 5 X 20 feet. All plots emerged and established satisfactorily. Assure II herbicide was applied 29 October 2020 at 11 oz/acre with 15 gallons of water for control of grassy weeds and volunteer wheat. PGR treatments were applied about the 4 leaf stage. Application to Mercedes was mid-morning 15 October with an ambient air temperature of 54 F. Application to Amanda, CC17066 and Hekip was made mid-morning 20 October with ambient air temperature of 51 F. Mercedes was

larger and developed quicker than other cultivars. Hekip was smaller and later that either Amanda or CC17066.

Winter survival was evaluated in by photographing 10-ft long row segments in each plot in November and again in late March. Comparison of these photographs showed no stand loss over winter. This was not surprising in that winter temperatures were very mild and no abrupt cold events occurred. Lodging and plant were evaluated prior to harvest. No difference in lodging or plant height due to PGR treatment was observed. Plots were swathed with a 5-foot wide Swift Current plot swather on 22 June and combining on 30 June. A 1999 Hege model 140 plot combine equipped with a draper and auger platform table and a 5 mm round-hole, scalloped lower sieve designed for canola was used. Harvested seed was collected in cloth bags and later cleaned with a M2B clipper cleaner with appropriately sized skimmer and scalper sieves. Seed was weighed and yield determined using harvested plot area. Oil content, percent protein, and test weight will be measure later this year at the Viterra lab in Warden, Washington.

Results:

Yield results for each cultivar and PGR treatment are shown in Table 1. The control PGR treatment, which was the fungicide Toledo applied at 4 oz ai, had the highest yield. The PGR Shortstop yielded about 200 lb/acre less and MEPEX yielded about 350 lb/acre less. Yield components were not measured, so the cause for this is not easy to determine. We suspect that either there was less branching and consequently fewer pods/plant or just fewer pods, if branching was not reduced. This resulted in less yield. Mercedes and CC17066 yielded the best at 2473 and 2404 lb/acre, respectively. Amanda and Hekip yield nearly 800 lb/acre less. No interaction of cultivar x PGR treatment was observed. This means that there was not differences among cultivars due to PGR treatments. Specific cultivars did not perform better or worse with respect to PGR treatments. All cultivars responded the same to PGR treatments.

Table 1. Yield of four cultivars of winter canola with three PGR treatments at CBARC 2020-2021.

PRG treatment	Winter canola cultivar				Average of PGR treatment
	Amanda	CC17066	Hekip	Mercedes	
	----------lb/acre----------				
Toledo Fungicide (control)	1723	2698	1787	2606	2203A
Shortstop + Toledo	1574	2416	1589	2515	2023B
MEPEX + Toledo	1598	2106	1449	2299	1863B
	Average of cultivar for treatments				
	1632B	2406A	1608B	2473A	

A or B = Significantly different at P = 0.05

Literature Cited:

Chen, C., G. Jackson, N. Karnes, D. Wichman, G. Johnson, and D. Johnson. 2005. Determining the feasibility of early seeding canola in the northern Great Plains. Agron. J. 97:1252–1262.

McCauley K. E., A. Post, J. D. Matz, and C. Goad. 2016. Controlling the Overwintering Capacity of Winter Canola Using Plant Growth Regulators to Manage Fall Growth. Abstracts American Society of Agronomy 2016. https://scisoc.confex.com/scisoc/2016am/webprogram/Paper102367.html

Yared Assefa, P. V. Vara Prasad, Chris Foster, Yancy Wright, Steven Young, Pauley Bradley, Michael Stamm, and Ignacio A. Ciampitti. 2018. Major Management Factors Determining Spring and Winter Canola Yield in North America. Crop Sci. 58:1-16.