

Spring Canola Seeding Rates

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Increased spring canola seed rates could increase crop stand establishment canopy development and ultimately, weed competitiveness and productivity by maximizing yield potential. In 2017, four separate studies were established in different rainfall zones and cropping systems scenarios, after no reduction in yield was observed as seeding rates increased from 2 lb A⁻¹ to 12 lb A⁻¹ during an initial study in 2016 conducted in Pullman, WA. These studies were established to evaluate canola seeding rates effects on crop yield and vegetative productivity across several different cropping scenarios.

Methods

All studies were planted with spring canola variety Hyclas 930 using an eight row Monosem planter on 10" row spacing calibrated to deliver seeding rate treatments. Seeding rates in 2016 were as follows; 3 (hilldrop), 4, 5, 6, 7, 8, 10, and 12 lb A⁻¹, and seeding rates in 2017 were; 4, 5, 6, 7, 8, 10, 11, and 12 lb A⁻¹. All studies were conducted in a randomized complete block design with 3 replications. The 2016 study was harvested using a Kincaid plot combine with a 5-foot header and the 2017 studies were all harvested using a 5-foot header Wintersteiger plot combine.

Pullman, WA

In 2016, the initial Pullman study was planted on April 20th, 2016 at the Cook Agronomy Farm near Pullman, WA, in a high rainfall zone with annual precipitation of greater than 17 inches (Schillinger et al. 2006). Plots were 10' by 75' long. The site was in a no-till system. The entire trial was fertilized with 80 lb of nitrogen and 20 lb of sulfur A⁻¹. Roundup PowerMax (glyphosate) was spilt applied at 11 fl oz A⁻¹, with 0.33 pt A⁻¹ of Stinger (clopyralid) added at the later application timing, detailed in Table 1.

Table 1. Blanket application details for the 2016 Pullman, WA study.

Date	Treatment	Field Rate	lb ai/A
May 5, 2016	Roundup PowerMax	11 fl oz/A	0.387
	AMS	3 lb/100 gal	
May 26, 2016	Roundup PowerMax	11 fl oz/A	0.387
	Stinger	0.33 pt/A	0.124
	AMS	3 lb/100 gal	

Crop stand counts were taken 62 days after planting (DAP) by taking two subsamples of a meter per row within each plot. The study was harvested on September 20, 2016.

Pullman, WA

In 2017, the repeated Pullman study was planted a no-till system on May 9, 2017 at the Palouse Conservation Field Station near Pullman, WA, also in a high rainfall zone. Plots were 8' by 75' long. Canola crop emerged on May 22, 2017. Trial site was fertilized with 80 lb nitrogen and 20 lb sulfur A⁻¹ on June 19, 2017. Trial was treated with Roundup Powermax (glyphosate) at 11 fl oz A⁻¹ for broadleaf weed control on May 26, 2017, detailed in Table 2.



Fig 1. Harvesting the 2017 Pullman, WA canola site

Table 2. Blanket application details for 2017 Pullman, WA study.

Date	Treatment	Field Rate	lb ai/A
May 26, 2016	Roundup PowerMax	11 fl oz/A	0.387
	NIS	0.25% v/v	
	AMS	3 lb/100 gal	

Leaf area index (LAI) was taken 44 [744 growing degree days (GDD)] and 72 (1462 GDD) DAP by taking two readings per plot [leaf area index (LAI) is the surface area of leaves per unit ground surface area and is used to characterize plant canopies]. The LAI for bare ground would equal 0 (Campbell and Norman 1998). Stand counts were taken 72 DAP by counting two meter lengths over two rows within each plot. Canola was harvested on September 6, 2017. The field site had an accumulative precipitation of 20.86” total for 1 year prior to harvest date of the trial (AgWeatherNet 2015).

Walla Walla, WA

The Walla Walla study was planted on April 21, 2017 in a grower’s field north of Walla Walla, WA, also in a high rainfall zone. Site was in a conventional tillage system and had been fertilized prior to planting by grower. Plots were 10’ by 75’ long. Canola emerged on May 5, 2017.

Leaf area index (LAI) was taken 69 (1463 GDD) DAP by taking two readings per plot. Stand counts were taken 69 DAP by counting two meter lengths over two rows within each plot. Branching per plant was taken for four plants per plot 69 DAP. The study was harvested on August 14, 2017. The field site had an accumulative precipitation of 20.87” total for 1 year prior to harvest date of the trial (AgWeatherNet 2015).



Fig 2. Walla Walla, WA, canola study 48 days after planting

Davenport, WA

The Davenport study was planted on May 18, 2017 into a conventional system at the Wilke Research and Extension Farm near Davenport, WA. Davenport, WA, is in a medium rainfall zone with annual precipitation of 12 to 17 inches (Schillinger et al. 2006). Site had been fertilized (60 lb nitrogen and 15 lb sulfur A⁻¹) prior to planting. Plots were 10’ by 75’ long. Canola emerged on May 29, 2017.

Leaf area index (LAI) was taken 33 (635 GDD), 40 (809 GDD), and 61 (1403 GDD) DAP by taking two readings per plot. Stand counts were taken 40 DAP by counting two meter lengths over two rows within each plot. The study was harvested on August 22, 2017. The field site had an accumulative precipitation of 17.19” total for 1 year prior to harvest date of the trial (AgWeatherNet 2015).

Statistical Analysis

All data were subjected to an analysis of variance using the statistical package built into the Agricultural Research Manager software system (ARM 8.5.0, Gylling Data Management).

Results

Pullman, WA

In 2016, spring canola stand counts increased as the seeding rate increased, with 10 plants m⁻¹ for the 4 lb A⁻¹ treatment and 31 plants m⁻¹ for the 12 lb A⁻¹ seeding rate (Table 3). As seeding rates increased, yields also increased. Yield for the seeding rate of 12 lb A⁻¹ was higher than the lowest seeding rate of 4 lb A⁻¹, with 1362 lb A⁻¹ compared to 824 lb A⁻¹. No reduction in yield was observed as seeding rate increased (Table 3).

Table 3. Stand counts and yield for 2016 Pullman, WA, spring canola seeding rate study (Hyclass 930). Pullman, WA, 2016. DAP = days after planting. Means followed by the same letter are not statistically significantly different ($\alpha=0.05$).

Trt	Seeding Rate			June 21, 2016	August 18, 2016
				62 DAP	
	seed/m	seed/ft	lb/A	Stand Counts	lb/A
				plants/meter	
1	26	8	4	10 a	824 a
2	32	10	5	15 ab	985 ab
3	39	12	6	16 ab	1012 ab
4	46	14	7	18 abc	970 ab
5	52	16	8	23 bc	1006 ab
6	66	20	10	25 cd	1222 ab
7	79	24	12	31 d	1362 b
Hill drop	20	6	3	12 a	1139 ab
			LSD	6	304

In the repeated 2017 study, there was no difference in canola stand counts, however, as seeding rate increased so did the number of plants m^{-1} , with 13 plants m^{-1} for the 4 lb A^{-1} treatment and 28 plants m^{-1} for the 12 lb A^{-1} seeding rate (Table 4). There were no observed differences in leaf area index (LAI) at 744 growing degree days (GDD) and 1462 GDD, although there was an increasing trend as seeding rate increased. As seeding rates increased, yields also increased. Yield for the seeding rate of 12 lb A^{-1} was greater than the lowest seeding rate of 4 lb A^{-1} , with 1825 lb A^{-1} compared to 1487 lb A^{-1} (Table 4).

Table 4. Leaf area index (LAI), stand counts and yield for the 2017 Pullman, WA, spring canola seeding rate study (Hyclass 930). Pullman, WA, 2017. DAP = days after planting. GDD = growing degree days. Means followed by the same letter are not statistically significantly different ($\alpha=0.05$).

Trt	Seeding Rate			June 22, 2017	July 20, 2017	Stand Counts	Yield
				44 DAP			
	seed/m	seed/ft	lb/A	LAI	LAI	plants/meter	lb/A
			744 GDD	1462 GDD			
1	26	8	4	1.23	2.87	13	1487 ab
2	32	10	5	1.21	2.79	17	1534 ab
3	39	12	6	1.28	2.56	16	1297 a
4	46	14	7	1.65	2.37	17	1623 ab
5	52	16	8	1.22	3.00	18	1471 ab
6	66	20	10	1.66	3.21	25	1742 b
7	73	22	11	1.43	2.65	23	1696 b
8	79	24	12	2.02	3.27	28	1825 b
			LSD	NS	NS	NS	241

Walla Walla, WA

The Walla Walla study had no difference in leaf area index (LAI) at 1463 GDD (Table 5). Stand counts increased as the seeding rate increased, with 7 plants m^{-1} at the 4 lb A^{-1} treatment and 25 plants m^{-1} for the 12 lb A^{-1} seeding rate. As seeding rate and stand counts increased, branching per plant decreased from 3.3 branches per plant to 1.4 branches per plant. There were no differences in yield for any seeding rate (Table 5). The lowest seeding rate of 4 lb A^{-1} produced 1928 lb A^{-1} yield and the highest seeding rate produced 1764 lb A^{-1} yield.

Table 5. Leaf area index (LAI), stand counts, branch counts, and yield for the 2017 Walla Walla, WA, spring canola seeding rate study (Hyclass 930). Walla Walla, WA, 2017. DAP = days after planting. GDD = growing degree days. Means followed by the same letter are not statistically significantly different ($\alpha=0.05$).

Trt	Seeding Rate			June 29, 2017 69 DAP			August 14, 2017
				LAI	Stand Counts	Branch Counts	Yield
	seed/m	seed/ft	lb/A	1463 GDD	plants/meter	branches/plant	lb/A
1	26	8	4	3.62	7 a	3.3 a	1928
2	32	10	5	3.49	11 ab	2.5 abc	1855
3	39	12	6	3.21	10 ab	3.0 ab	1804
4	46	14	7	3.39	12 ab	2.6 abc	1791
5	52	16	8	3.05	14 bc	2.2 abc	1828
6	66	20	10	3.25	18 cd	1.6 bc	1812
7	73	22	11	3.18	21 de	1.5 bc	1854
8	79	24	12	3.68	25 e	1.4 c	1764
	LSD			NS	4	1	NS

Davenport, WA

The spring canola seeding rate study in Davenport, WA also had no difference in leaf area index (LAI) between any treatment at 635 GDD, 809 GDD, and 1403 GDD (Table 6). Stand counts, or plants per meter, increased at the planting rate increased with 12 plants m^{-1} for 4 lb A^{-1} and 38 plants m^{-1} for the 12 lb A^{-1} rate. No differences in yield were observed for any seeding rate (Table 6). The lowest seeding rate of 4 lb A^{-1} produced 819 lb A^{-1} yield and the highest seeding rate, 12 lb A^{-1} , produced 841 lb A^{-1} yield.

Table 6. Leaf area index (LAI), stand counts and yield for spring canola seeding rate study (Hyclass 930). Davenport, WA, 2017. DAP = days after planting. GDD = growing degree days. Means followed by the same letter are not statistically significantly different ($\alpha=0.05$).

Trt	Seeding Rate			June 20, 2017 33 DAP	June 27, 2017 40 DAP	July 18, 2017 61 DPP	August 22, 2017	
				LAI	LAI	Stand Counts	LAI	Yield
	seed/m	seed/ft	lb/A	635 GDD	804 GDD	plants/m	1403 GDD	lb/A
1	26	8	4	1.21	1.31	12 a	1.12	819
2	32	10	5	1.02	1.65	13 a	1.46	919
3	39	12	6	1.37	1.88	15 ab	1.66	908
4	46	14	7	1.43	1.55	19 bc	1.21	890
5	52	16	8	1.54	2.03	23 cd	1.33	925
6	66	20	10	1.55	1.87	26 d	2.09	932
7	73	22	11	1.35	2.14	32 e	1.18	794
8	79	24	12	1.74	1.76	38 f	1.42	841
	LSD			NS	NS	4	NS	NS



Fig 3. Planting the Davenport, WA, canola study on May 18, 2017.

Crop establishment and drill type should be taken into consideration when choosing a seeding rate to utilize maximum yield and economic returns. Fertilizer requirements, cultivar type and seed cost should also be taken into consideration when choosing a seeding rate.

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Additional Tables

Table 7. Rainfall Totals (1 year based on Harvest Date (AgWeatherNet 2015))

Trial Location	Harvest Date	Accum Precip (in)
Pullman, WA	September 6, 2017	20.86
Walla Walla, WA	August 14, 2017	20.87
Davenport, WA	August 22, 2017	17.19
Almira, WA	August 31, 2017	16.96

Table 8. Composite soil analysis by location at planting

Trial Location	NO3-N (lbs/A)	NH4-N (lbs/A)	S (ppm)	P (ppm)	K (ppm)	Boron (ppm)	Zinc (ppm)	% OM	pH	CEC	Soil Type
Pullman	69	17	3	47	628	0.46	0.89	3.52	5.3	15.4	Silt Loam
Walla Walla	156	16	4	38	752	0.39	1.05	2.14	5.3	13.8	Silt Loam
Davenport	63	12	2	23	463	0.37	0.83	2.76	5.1	13.5	Silt Loam
Almira	10	16	3	29	437	0.44	1.11	2.22	5.8	14.7	Silt Loam

Appendix

Almira, WA

A canola seeding rate study was also established in a grower's field near Almira, WA; a low rainfall zone with annual precipitation of less than 12 inches (Schillinger et al. 2006). The study was planted on May 18, 2017 using a monosom drill on 10' spacing calibrated to deliver seeding rate treatments detailed in Table 9. The field site was in a no-till management system. Plots were 10' by 80' long. Canola emerged on May 31, 2017. The site had heavy plant residue compared to the other study sites. However, due to unanticipated circumstances the Almira study did not receive fertilizer prior to or post planting. There was also no POST weed control applied to the Almira site.



Fig 4. Planting the Almira, WA, canola study on May 18, 2017.

Leaf area index (LAI) was recorded 33 (604 GDD), 40 (784 GDD), and 61 (1401 GDD) DAP by recording two measurements per plot. Stand counts were taken 40 DAP by counting two meter lengths over two rows within each plot. Canola was harvested on August 31, 2017. The field site had an accumulative precipitation of 16.96" total for 1 year prior to harvest date of the trial (AgWeatherNet 2015).

The spring canola seeding rate study in Almira, WA had no difference in leaf area index (LAI) between treatments at 604 GDD, 784 GDD, and 1401 GDD (Table 9). Stand counts, or plants per meter, increased at the planting rate increased with 10 plants m^{-1} for 4 lb A^{-1} and 33 plants m^{-1} for the 12 lb A^{-1} rate. There were no differences in yield observed for any seeding rates. However, canola yields decreased at seeding rates increased. The lowest seeding rate of 4 lb A^{-1} produced 447 lb A^{-1} yield and the highest seeding rate of 12 lb A^{-1} produced 223 lb A^{-1} yield (Table 9). The serve reduction in yield compared to the Davenport site could be due to the lack of available nutrients present at the Almira site since fertilizers were not applied. The soil sample indicated there was only 26 lb of nitrogen A^{-1} at Almira compared to 75 lb of nitrogen A^{-1} at Davenport (Table 8).

Table 9. Leaf area index (LAI), stand counts and yield for spring canola seeding rate study (*Hyclas 930*). Almira, WA, 2017. DAP = days after planting. GDD = growing degree days. Means followed by the same letter are not statistically significantly different ($\alpha=0.05$).

Trt	Seeding Rate			June 20, 2017	June 27, 2017	July 18, 2017	August 31, 2017	
				33 DAP	40 DAP	61 DAP	2017	
	seed/m	seed/ft	lb/A	LAI	LAI	Stand Counts	LAI	Yield
			604 GDD	784 GDD	plants/m	1401 GDD	lb/A	
1	26	8	4	0.50	0.78	10 a	0.94	447
2	32	10	5	0.31	0.56	11 a	0.76	396
3	39	12	6	0.27	0.72	14 a	0.71	382
4	46	14	7	0.24	0.72	17 a	0.69	380
5	52	16	8	0.12	0.54	17 a	0.88	325
6	66	20	10	0.17	0.44	24 b	0.75	282
7	73	22	11	0.14	0.58	25 b	0.61	267
8	79	24	12	0.19	0.38	33 c	0.58	223
	LSD			NS	NS	8	NS	NS

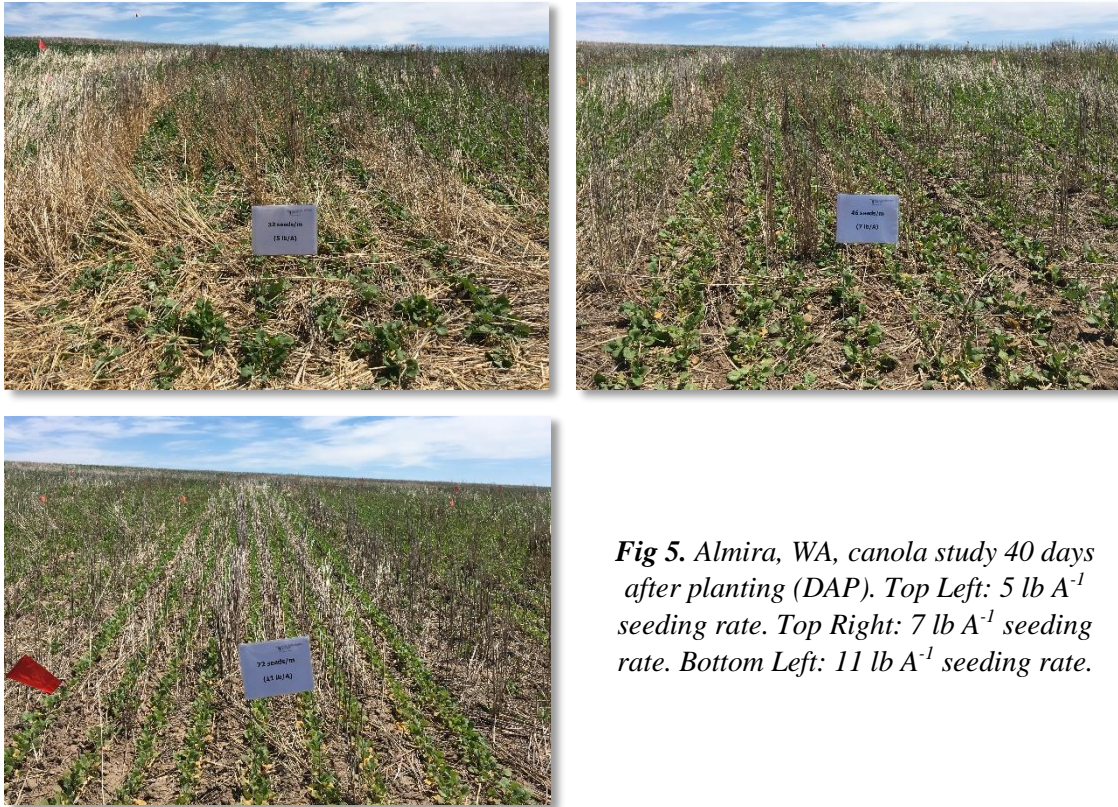


Fig 5. Almira, WA, canola study 40 days after planting (DAP). Top Left: 5 lb A⁻¹ seeding rate. Top Right: 7 lb A⁻¹ seeding rate. Bottom Left: 11 lb A⁻¹ seeding rate.

References

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