

Seed Treatments for Flea Beetle Control in Spring Canola, 2025

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Table 1. Location, experiment and agronomic information.

	Fargo	Langdon	Roseau
Trial Latitude (LLC)	46.901150	48.756286	48.847457
Trial Longitude (LLC)	-96.819222	-98.339257	-95.791617
Canola Variety	DK401TL	DK401TL	DK401TL
Previous Crop	HRSW	HRSW	HRSW
Planting Date	May 5	May 30	May 8
Emergence Date	May 12	June 6	May 20
Plot Size	4 ft x 20 ft	4 ft x 20 ft	5 ft x 25 ft
Row Spacing	6 inches	6 inches	7.5 inches
Seeding Depth	0.75 inch	0.75 inch	0.75 inch
Seeding Rate	14 seeds/ft ²	14 seeds/ft ²	14 seeds/ft ²
Experimental Design	RCBD, 4 reps	RCBD, 4 reps	RCBD, 4 reps
Harvest Date	September 3	September 26	September 10

Materials and Methods

The trials were conducted at the NDSU Campus Agronomy farm in Fargo, the Langdon REC in Langdon, and near Roseau, MN. See Table 1 for planting dates, trial design, seeding rates and other information.

The efficacy of various seed treatments was evaluated for controlling crucifer and striped flea beetles in spring canola. Dekalb DK401TL canola seed was treated prior to planting. Two neonicotinoid seed treatments, Helix Vibrance (thiamethoxam) and Prosper Evergol (clothianidin) were tested alone and in combination with three rates of either Lumiderm or Fortenza (cyantraniliprole). Prosper Evergol also was tested in combination with two rates of Buteo Start (flupyradifurone), and in combination with the commercial rates of Lumiderm and Buteo Start. Additionally, foliar applications of Brigade 2EC were used alone and in combination with insecticidal seed treatments. Treatments, rates and active ingredients are listed in Table 2. Seed for Treatments 1, 2 and 12 were treated with a custom fungicide mix that equated with the active ingredients and rates found in the fungicide portion of Helix Vibrance.

Sampling activities, dates and crop stages are given in Table 3. Plots were rated for flea beetle feeding injury using the 0-6 scale developed by Dr. Janet Knodel, with 0 = no feeding and 6 = dead plant. Within each plot, 10 randomly selected seedlings were rated. For analysis, the 10 ratings were averaged for a single rating value per plot. We attempted to rate feeding injury at 7, 10 and 14 days after emergence (DAE), but this was not possible at each location due to weather and other field research commitments. The Roseau trial experienced extremely uneven emergence, which delayed injury rating timing and made injury ratings difficult. Plant stand was measured by counting the number of live plants in three square feet at two locations within each plot, and calculating the number of plants per square foot.

Foliar applications of Brigade 2EC (bifenthrin) were made to Treatments 2, 5, 8, 11 and 12 at Fargo and Langdon immediately following the second injury and defoliation ratings (May 27 and June 17), respectively. At Roseau, the first injury and defoliation ratings could not be completed before the

foliar insecticide application. Instead, foliar applications were conducted on May 28, three days prior to the first rating. The second Brigade 2EC application was made to Treatment 12 one week after the first at all locations. All foliar applications were made with a backpack CO₂ sprayer using TeeJet 80015 flat fan nozzles at 40 PSI and a spray volume of 20 GPA.

Plots were harvested at maturity by straight combining with research plot combines, except at Langdon, where they were swathed prior to harvest. Grain weight, percent moisture content, and test weight were collected via the onboard weigh systems on the plot combines used at each location. Yields were adjusted to 8.5% standard grain moisture. All data were analyzed using the GLM procedure in SAS version 9.4 statistical software. The Fisher's LSD post-hoc test ($P < 0.05$) was used to test for significance among treatment means when the main effect F-test was significant ($P < 0.05$).

Table 2. Treatments, active ingredients and rates used in the trial.

Treatment No.	Treatment Name	Product Rate(s)	Active Ingredient(s)	AI Rate (s) Metric
1	Fungicide Check			
2	Brigade 2EC	2.6 fl oz/a	Bifenthrin	0.04 lb/a
3	Helix Vibrance	23 fl oz/cwt	Thiamethoxam	400 g/100 kg
4	Helix Vibrance Fortenza ¹	23 fl oz/cwt 10.2 fl oz/cwt	Thiamethoxam Cyantraniliprole	400 g/100 kg 400 g/100 kg
5	Helix Vibrance Fortenza ¹ Brigade 2EC	23 fl oz/cwt 10.2 fl oz/cwt 2.6 fl oz/a	Thiamethoxam Cyantraniliprole Bifenthrin	400 g/100 kg 400 g/100 kg 0.04 lb/a
6	Prosper Evergol	21.5 fl oz/cwt	Clothianidin	400 g/100 kg
7	Prosper Evergol Lumiderm	21.5 fl oz/cwt 9.8 fl oz/cwt	Clothianidin Cyantraniliprole	400 g/100 kg 400 g/100 kg
8	Prosper Evergol Lumiderm Brigade 2EC	21.5 fl oz/cwt 9.8 fl oz/cwt 2.6 fl oz/a	Clothianidin Cyantraniliprole Bifenthrin	400 g/100 kg 400 g/100 kg 0.04 lb/a
9	Prosper Evergol Buteo Start ²	21.5 fl oz/cwt 9.6 fl oz/cwt	Clothianidin Flupyradifurone	400 g/100 kg 300 g/100 kg
10	Prosper Evergol Buteo Start	21.5 fl oz/cwt 16 fl oz/cwt	Clothianidin Flupyradifurone	400 g/100 kg 500 g/100 kg
11	Prosper Evergol Buteo Start ² Brigade 2EC	21.5 fl oz/cwt 9.6 fl oz/cwt 2.6 fl oz/a	Clothianidin Flupyradifurone Bifenthrin	400 g/100 kg 300 g/100 kg 0.04 lb/a
12	Brigade 2EC (2 apps)	2.6 fl oz/a	Bifenthrin	0.04 lb/a
13	Prosper Evergol Lumiderm Buteo Start ²	21.5 fl oz/cwt 9.8 fl oz/cwt 9.6 fl oz/cwt	Clothianidin Cyantraniliprole Flupyradifurone	400 g/100 kg 400 g/100 kg 300 g/100 kg

¹Fortenza substituted for Lumiderm, product rate adjusted to match commercial Lumiderm active ingredient rate.

²Commercial Buteo Start rate when used in combination with a neonicotinoid.

Table 3. Sampling activities, sampling dates (DAE = days after emergence), and crop stages.

Activity	Fargo			Langdon			Roseau		
	Date	DAE	Crop Stage	Date	DAE	Crop Stage	Date	DAE	Crop Stage
Stand Count	May 27	15	2-leaf	June 9 June 17	3	Cotyledon 2-leaf	June 5	16	Cotyledon- 2-leaf
Injury Rating 1 Defoliation 1	May 19	7	Cotyledon	June 9	3	Cotyledon	May 31	11	Cotyledon- 2-leaf
Injury Rating 2 Defoliation 2	May 27	15	2-leaf	June 17	11	2-leaf	June 5	16	Cotyledon- 4-leaf
Injury Rating 3 Defoliation 3	June 5	24	4-leaf	June 24	18	4-leaf	---	---	---

Results and Discussion

Flea beetle activity and seedling feeding was unusually light due to cold, dry conditions from mid-May through June. These conditions favored canola growth but not flea beetle feeding activity. Flea beetles are most active and destructive to canola seedlings when warm, dry conditions exist during the susceptible seedling stages from emergence through the 6-leaf stage.

At Fargo, flea beetle numbers were very low and no feeding activity was noted at the first rating date (7 DAE). At the second rating date (15 DAE), there were significant differences among treatments for flea beetle injury, but not for percent defoliation. Injury ratings were very low and injury was mainly on the cotyledons. Injury progressed by the third rating date (24 DAE), and although there were significant differences among treatments for injury and defoliation, the values were again low. In general, all treatments that received a foliar bifenthrin application had less feeding injury and less defoliation at 24 DAE compared to insecticidal seed treatments only. There were no significant differences among treatments for established plant stand and grain yield. Treatment means for Fargo are presented in Table 4.

At Langdon, there were no significant differences among treatments for feeding injury or defoliation for the first rating date at 3 DAE. Flea beetle activity had just begun in the trial. At the second rating date (11 DAE), there were pronounced and significant differences among treatments for feeding injury and defoliation. In general, Treatment 1, Treatments 3 and 6 (neonicotinoids only), Treatments 2 and 12 (bifenthrin only), Treatments 4 and 7 (neonicotinoids + cyantraniliprole), and Treatments 5 and 8 (neonicotinoids + cyantraniliprole + bifenthrin) had greater feeding injury and defoliation compared to Treatments 9, 10, 11 and 13, all of which contained flupyradifurone. The same trend was demonstrated at the third rating date (18 DAE), although treatments that received a foliar bifenthrin application showed some improvement. By 18 DAE, seedlings were at the 4-leaf stage and flea beetle pressure was winding down. The same trend was observed for grain yield, where treatments that included flupyradifurone had higher yields compared to neonicotinoids alone and in combination with cyantraniliprole. There were no significant differences among treatments for established plant stand at either the first or second sampling date (only the second plant stand results are presented). Treatment means for Langdon are presented in Table 5.

Roseau experienced very uneven emergence, which complicated the timing of ratings and foliar bifenthrin applications. There were no significant differences among treatments for established plant stand, although stands were thin due to soil crusting during emergence. Significant treatment differences were observed for both rating dates (11 and 16 DAE) for feeding injury and defoliation. The same trend among treatments that was observed at Langdon also was observed at Roseau. Despite this, there were no significant differences among treatments for grain yield. Treatment means for Roseau are presented in Table 6.

Table 4. Treatment means for flea beetle injury, percent defoliation, plant stand, and grain yield at Fargo, 2025.

Trt. No.	Treatment	Injury 7 DAE	% Defoliation 7 DAE	Injury 15 DAE	% Defoliation 15 DAE	Injury 24 DAE	% Defoliation 24 DAE	Plant Stand (plants/ft ²)	Grain Yield (lbs/acre)
1	Fungicide Check	0	0	1.7 a	0.5 a	2.3 ab	13.4 ab	14.5 a	2,696.0 a
2	Brigade 2EC	0	0	1.2 ab	0.5 a	2.1 bc	7.5 cde	14.3 a	3,087.0 a
3	Helix Vibrance	0	0	0.8 bc	0.2 a	2.4 ab	11.6 abc	14.1 a	3,258.9 a
4	Helix Vibrance Fortenza ¹	0	0	0.8 bc	0.3 a	2.3 ab	12.2 abc	15.0 a	3,084.2 a
5	Helix Vibrance Fortenza ¹ Brigade 2EC	0	0	0.9 bc	0.2 a	2.1 bc	10.0 bcd	12.3 a	3,193.2 a
6	Prosper Evergol	0	0	0.7 c	0.0 a	2.2 abc	10.6 abc	14.2 a	2,993.6 a
7	Prosper Evergol Lumiderm	0	0	0.7 c	0.6 a	2.2 abc	12.2 abc	12.9 a	2,764.1 a
8	Prosper Evergol Lumiderm Brigade 2EC	0	0	0.7 c	0.4 a	2.1 bc	9.1 bcd	12.5 a	3,247.1 a
9	Prosper Evergol Buteo Start ²	0	0	0.7 c	0.1 a	2.6 a	14.1 a	12.2 a	3,264.5 a
10	Prosper Evergol Buteo Start	0	0	0.6 c	0.3 a	2.2 abc	9.1 bcd	13.4 a	3,538.8 a
11	Prosper Evergol Buteo Start ² Brigade 2EC	0	0	0.7 c	0.3 a	1.8 c	3.8 e	11.5 a	2,927.0 a
12	Brigade 2EC (2 apps)	0	0	0.7 c	0.3 a	1.8 c	4.4 de	13.4 a	2,952.3 a
13	Prosper Evergol Lumiderm Buteo Start ²	0	0	1.1 bc	0.1 a	2.6 a	11.9 abc	13.2 a	2,878.2 a
	F-value	---	---	3.25	0.72	3.03	3.60	0.98	1.22
	P-value	---	---	0.0031	0.7193	0.0049	0.0014	0.4834	0.3105
	LSD	---	---	0.48	NS	0.41	4.84	NS	NS

Means within a column that share the same letter are not significantly different (P<0.05).

¹Fortenza substituted for Lumiderm, product rate adjusted to match commercial Lumiderm active ingredient rate.

²Commercial Buteo Start rate when used in combination with a neonicotinoid.

Table 5. Treatment means for flea beetle injury, percent defoliation, plant stand, and grain yield at Langdon, 2025.

Trt. No.	Treatment	Injury 3 DAE	% Defoliation 3 DAE	Injury 11 DAE	% Defoliation 11 DAE	Injury 18 DAE	% Defoliation 18 DAE	Plant Stand (plants/ft ²)	Grain Yield (lbs/acre)
1	Fungicide Check	0.2 a	0.1 a	3.4 a	30.9 a	3.5 a	28.4 ab	13.5 a	2,978.4 de
2	Brigade 2EC	0.4 a	0.8 a	3.5 a	32.5 a	3.3 ab	26.6 abc	12.0 a	3,123.2 de
3	Helix Vibrance	0.2 a	0.5 a	3.3 a	32.5 a	3.0 abc	27.2 abc	13.0 a	2,889.9 e
4	Helix Vibrance Fortenza ¹	0.3 a	0.3 a	2.5 c	17.0 bc	2.4 cde	16.5 cd	12.5 a	3,228.4 de
5	Helix Vibrance Fortenza ¹ Brigade 2EC	0.2 a	0.3 a	2.7 bc	27.3 ab	2.4 de	17.3 cd	12.7 a	3,365.7 b-e
6	Prosper Evergol	0.3 a	0.3 a	3.2 ab	30.6 a	3.2 ab	30.7 a	12.3 a	3,091.2 de
7	Prosper Evergol Lumiderm	0.2 a	0.4 a	3.3 a	29.7 a	3.4 a	30.6 a	12.3 a	3,290.6 cde
8	Prosper Evergol Lumiderm Brigade 2EC	0.1 a	0.3 a	3.4 a	32.8 a	3.2 ab	26.6 abc	11.6 a	3,187.2 de
9	Prosper Evergol Buteo Start ²	0.2 a	0.4 a	2.3 cd	13.1 c	2.3 de	15.4 d	12.2 a	3,820.2 ab
10	Prosper Evergol Buteo Start	0.1 a	0.2 a	1.3 e	5.3 c	1.7 f	8.3 d	12.3 a	3,906.8 a
11	Prosper Evergol Buteo Start ² Brigade 2EC	0.3 a	0.6 a	1.8 de	12.1 c	2.0 ef	7.7 d	11.6 a	3,771.8 abc
12	Brigade 2EC (2 apps)	0.4 a	0.5 a	3.2 ab	28.1 ab	2.8 bcd	17.9 bcd	12.8 a	3,450.4 a-d
13	Prosper Evergol Lumiderm Buteo Start ²	0.3 a	0.3 a	2.2 cd	13.0 c	2.1 ef	12.9 d	12.3 a	3,266.0 de
	F-value	0.98	0.58	13.29	5.32	8.24	4.90	0.44	3.55
	P-value	0.4870	0.8406	<0.0001	<0.0001	<0.0001	<0.0001	0.9367	0.0016
	LSD	NS	NS	0.57	12.17	0.61	10.69	NS	488.91

Means within a column that share the same letter are not significantly different (P<0.05).

¹Fortenza substituted for Lumiderm, product rate adjusted to match commercial Lumiderm active ingredient rate.

²Commercial Buteo Start rate when used in combination with a neonicotinoid.

Table 6. Treatment means for flea beetle injury, percent defoliation, plant stand, and grain yield at Roseau, 2025.

Trt. No.	Treatment	Injury 11 DAE	% Defoliation 11 DAE	Injury 16 DAE	% Defoliation 16 DAE	Plant Stand (plants/ft ²)	Grain Yield (lbs/acre)
1	Fungicide Check	3.4 a	28.8 a	3.5 a	32.5 a	6.5 a	2,963.7 a
2	Brigade 2EC	3.4 a	24.7 abc	3.1 ab	27.5 ab	6.0 a	2,883.2 a
3	Helix Vibrance	3.0 a	19.7 bcd	3.3 a	23.8 b	5.8 a	3,017.2 a
4	Helix Vibrance Fortenza ¹	2.1 bc	12.8 def	2.5 bcd	15.6 cd	6.1 a	2,900.8 a
5	Helix Vibrance Fortenza ¹ Brigade 2EC	1.7 cd	17.5 cd	1.8 de	14.4 d	7.6 a	2,993.9 a
6	Prosper Evergol	3.3 a	26.6 ab	3.0 ab	25.6 ab	6.1 a	2,935.6 a
7	Prosper Evergol Lumiderm	1.5 cd	14.1 de	2.4 bcd	23.8 b	6.8 a	3,060.5 a
8	Prosper Evergol Lumiderm Brigade 2EC	2.4 b	17.8 cd	2.1 cde	14.1 de	6.5 a	2,980.3 a
9	Prosper Evergol Buteo Start ²	1.2 de	6.3 efg	1.5 ef	13.1 de	6.3 a	2,888.4 a
10	Prosper Evergol Buteo Start	0.8 e	3.4 g	1.6 ef	10.9 de	6.0 a	2,960.5 a
11	Prosper Evergol Buteo Start ² Brigade 2EC	0.8 e	4.1 g	1.1 f	6.6 e	6.0 a	2,933.3 a
12	Brigade 2EC (2 apps)	3.1 a	23.8 abc	2.5 bc	23.1 bc	5.4 a	2,819.1 a
13	Prosper Evergol Lumiderm Buteo Start ²	0.8 e	5.9 fg	1.8 de	12.2 de	5.5 a	2,984.2 a
	F-value	26.28	10.37	9.29	8.58	0.77	0.70
	P-value	<0.0001	<0.0001	<0.0001	<0.0001	0.6802	0.7447
	LSD	0.59	7.88	0.70	7.57	NS	NS

Means within a column that share the same letter are not significantly different (P<0.05).

¹Fortenza substituted for Lumiderm, product rate adjusted to match commercial Lumiderm active ingredient rate.

²Commercial Buteo Start rate when used in combination with a neonicotinoid.

Acknowledgements: We would like to thank the Northern Canola Growers Association for financial support and our Agronomy crew, Lawrence Henry and Rick Duerr in planting and harvesting the trial.