

Herbicide Screening for Use in Established Alsike Clover Grown for Seed

For: Saskatchewan Forage Seed Development Commissions



Brianne McInnes BSc., AAg
Research Associate
Northeast Agriculture Research Foundation
Melfort, SK
neag.assistant@gmail.com

Jessica Pratchler MSc., PAg
Technical Advisor
Northeast Agriculture Research Foundation
Melfort, SK
neag.agro@gmail.com

Objective/Rationale: To evaluate crop tolerance of Alsike clover and weed control efficacy of spring-applied herbicides in support of registration under the Minor Use Program.

Methodology: This small plot research trial was conducted in a randomized complete block design with 4 replicates. Each plot was 2m by 7m with borders on each end. There were 3 treatments consisting of an untreated control and Viper ADV + Assure II at a 1X and 2X rate (Table 1).

Table 1: Treatments used in Herbicide Screening for Established Alsike Clover Grown for Seed in Melfort, SK 2019.

TRT #	Product	Rate	Timing
1	Untreated		
2	Viper ADV + Assure II	1x (0.404 L/ac + 300 mL/ac)	Early Stage (2-6 leaf stage)
5	Viper ADV + Assure II	2x (0.808 L/ac + 600 mL/ac)	Early Stage (2-6 leaf stage)

On June 13, 2018 Alsike clover (var. Dawn) was seeded at 2.5 lbs/ac into wheat stubble. All plots were seeded using a ConservaPak airseeder on 9-inch row spacing and placed at a 0.5-inch depth. The only fertilizer applied was seed-placed phosphorus at 40 kg/ha of 11-52-0.

This trial received crop protection products as needed, exclusive of the herbicide treatments. In 2018, weeds were controlled with an herbicide application of Odyssey and Assure II during July, followed by mowing weeds above the crop canopy late August. No seed treatments or inoculants were applied. The 2019 herbicide treatments were applied on May 31st, 2019 and applied at rates indicated in Table 1. No fungicides or insecticides were applied. Reglone was applied at 1.9 L/ac on August 22, 2019 as a desiccant. Lastly, all plots were harvested on September 16, 2019 with a plot combine.

Data collection consisted of establishing baselines, crop tolerance, weed control, yield, and quality. Baseline was accounted for by noting the weed species present prior to herbicide application, as well as noting crop health. Crop tolerance was rated 4-7 days and 28-35 days post herbicide application on a 0-100% scale. Weed control was determined by noting the major weed species and %broadleaf control both 4-7 days and 28-35 days after treatment applications. Weed control was also noted later in the growing season. Yield was determined by cleaning and weighing each harvested plot. Clean weights were then converted into kg/ha and lbs/ac equivalents while correcting to 11% moisture. Quality was accounted for by sending composite samples of each treatment away for %purity and % germination determination. Lastly, statistical analysis was completed using one-way ANOVA in Statistix 10.

Results:

Environmental Conditions: May through August were cooler than normal, while September was warmer (Table 3). Both May and August were 1.9°C cooler, while June, July, and September were within 0.4 to 0.6°C of the long-term climate normal for each respective month. May, July, and August received less precipitation than normal, while June and September had more than normal (Table 2). However, both July and September were within 4 mm of the long-term climate normal, while May, June, and August were within 21 to 33 mm of their normal. Due to the cool, dry conditions in May, seedling germination was slow and sporadic. The wet conditions in June, assisted in plant establishment, but also resulted in more seedling germination. This caused for multiple growth stages within a small area, ultimately leading to

increased variability within and between plots. This inevitably led to delays in maturity and harvesting. Overall, the growing season was slightly cooler and drier than the long-term climate normal.

Table 2: Mean temperatures and precipitation collect from the Environment Canada Weather Station at Melfort SK., from May to September 2019.

	May	June	July	August	September	Average/Total
--- Mean Temperature (°C) ---						
2019	8.8	15.3	16.9	14.9	11.2	13.4
Long-Term ^x	10.7	15.9	17.5	16.8	10.8	14.3
--- Total Precipitation (mm) ---						
2019	18.8	87.4	72.7	30.7	43.0	252.6
Long-Term ^x	42.9	54.3	76.7	52.4	38.7	265.0

^x Long-term climate normal from Environment Canada Weather Station located at Melfort SK., from 1981-2010

Base Line: On May 31st when all treatments were applied, the crop was at the 4-leaf stage and was 2.5 to 4 inches tall. The crop had good stand, but appeared to be slightly suffering from some type of environmental damage (Figure 1). Leaves of some of the plants were slightly yellow, and effects were sporadic throughout the crop. However, general crop health was good. At the time of application Canadian thistle was the only weed present, with only two found within the entire testing area.



Figure 1: Sporadic yellowing of the crop early in the growing season, with good Alsike clover stand. A closer look at the more yellowed plants.

Crop Tolerance: One week after herbicide application, the tank-mix of Viper ADV + Assure II caused significant crop damage (Table 3). However, crop damage was overall minimal with only up to 9% damage occurring at the 2x application rate. The crop damage that occurred with the 1x rate, were statistically similar to the control. By 28-35 days after application, crop damage remained in the lower canopy and was not noted on any newly emerged leaves. Thus, crop tolerance was noted at 100% one month after application. This suggests that any negative effects caused by Viper ADV + Assure II application were not transient throughout the plant.

Weed Control: Weed control was noted as 100% across all treatments 4 to 7 days after application as well as 28 to 35 days post (data not shown). Due to the very dry spring, initial weed pressure was minimal, as noted earlier. Therefore, there were little to no weeds to control in the trial area at the time of application. Furthermore, Viper ADV + Assure II are not registered for the control of Canadian thistle. As it was the only weed noted at the time of application, it was not unexpected that control did not occur. Later in August an additional weed survey was conducted in the plot area. This survey also found minimal weeds, with just one volunteer alfalfa and the original 2 Canadian thistles being noted.

Yield: As expected due to the minimal crop damage and initial weed pressure, yield was not significantly impacted by the herbicide treatments (Table 3). Overall, yields in 2019 were similar to those in previous years.

Table 3: Statistical analysis of treatment factors for Herbicide Screening for Established Alsike Clover Grown for Seed in Melfort, SK 2019.

Source	Crop Tolerance ²		Yield ² (kg/ha)	Yield ² (lbs/ac)
	4-7 days	28-35 days		
One-way ANOVA	0.0004**	--	0.2873	0.2873
Grand Mean	96.67	--	477.97	426.05
CV	2.59	--	5.92	5.92
Control	100.00a	100.00a	478.25a	426.30a
Viper ADV+ Assure II 1X	98.75a	100.00a	454.25a	404.91a
Viper ADV+ Assure II 2X	91.25b	100.00a	501.41a	446.95a

*** highly significant $p < 0.0001$; * significant at $p < 0.05$

² letters signify values that are significantly different at $p < 0.05$

Quality: Due to only 3 composite samples sent for germination and purity determination, statistical analysis was not performed. However, based on the results it is quite clear that treatment differences had very negligible effects to both % purity and % germination of Alsike clover seed, as all values fell within a very small and acceptable range (Figure 2).

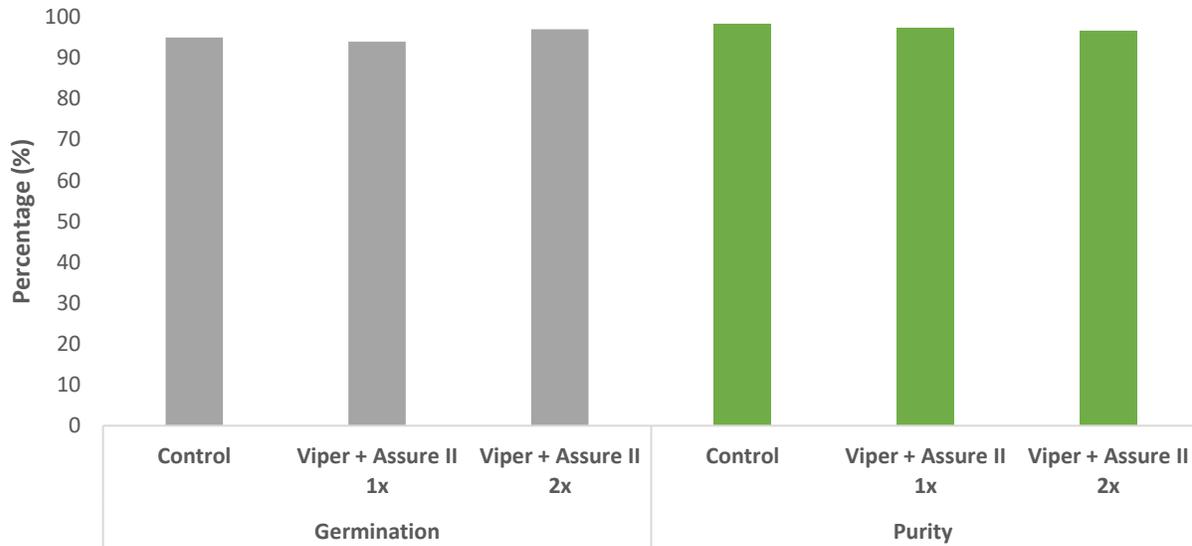


Figure 2: Purity and Germination (%) of harvested seed from Herbicide Screening for Established Alsike Clover Grown for Seed in Melfort, SK 2019.

Conclusion: When considering all data collection parameters, Alsike Clover is very tolerant to Viper ADV tank-mixed with Assure II, at both application rates. Although the crop demonstrated an initial decrease in tolerance, this did not correlate to reduced yields or germination, as all values were comparable to the control. One of the limiting factors in 2019 was reduced weed pressure, and thus weed control was not evaluated amongst the different treatments. Furthermore, this was supported by the high purity within the submitted samples. Overall, this data set can be confidently used to support registration of Viper ADV + Assure II, within the minor use program.