

Project No. A8317
Date: August 16, 2018
Humboldt, Saskatchewan

Test Summary Report

The Effects on Canola Placement Using a Seed Brake on an Air Seeder Hoe Drill

For:
Airguard Inc.
Abbotsford, British Columbia

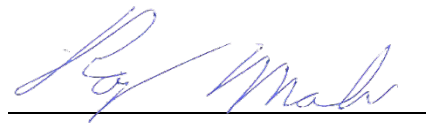


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The Effects on Canola Placement Using a Seed Brake on an Air Seeder Hoe Drill

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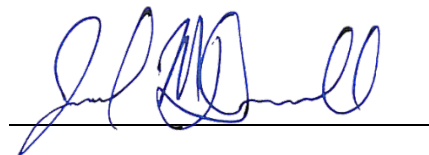


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1. Executive Summary

Airguard Inc. (the Client) manufactures and sells a seed brake for use with air drills. They have tasked the Prairie Agricultural Machinery Institute (PAMI) to evaluate the effect of a seed brake on an air drill's seed placement using a hoe opener with canola.

Table 1 shows how the use of a seed brake affected the variability of seed depth by showing the percentage of seeds found within a band within .039 in.(1mm), .19 in.(5mm), and .39 in.(10mm)of the mean depth. Use of a seed brake significantly decreased the variability of seed depth for the canola seeded with a hoe drill (at a 95% confidence level).

Table 1. Summary of data on variability of seed depth with and without a seed brake.

	Mean depth in. (mm)	% of seed depths within		
		.039 in. (1mm) of mean	.19 in. (5mm) of mean	.39 in. (10mm) of mean
No brake	.86(22)	12	56	84
Brake	.71(18)	18	88	100

PAMI makes no inference to the effects of a seed brake on the seed, emergence, and/or yield. The intention of this work was solely focused on seed depth variation with and without a seed brake.

2. Test Set-up and Procedure

The Prairie Agricultural Machinery Institute (PAMI) conducted in-field testing for Airguard Inc. (the Client) to facilitate a depth of seed planting trial for canola. A producer-cooperator was chosen to seed with a hoe drill (**Figure 1**). For the in-field test, two replications with a seed brake installed and two replications without a seed brake installed were observed. **Table 2** lists the parameter values used for the hoe drill in the field trials.



Figure 1. Seeding canola with a hoe drill.

After the planting operation was completed, the crop was left until full emergence had occurred. A sample size of 25 consecutive plants per replication was excavated. The depth was quantified by measuring the vertical distance from the soil surface to the seed depth. The seed depth location was established either by the seed remnant or at the origin of the plant root if the seed was not present (**Figure 2**).

Table 2. Test parameters.

Parameter	Canola with Hoe Opener
Seed brake type	Airguard 7360
Seed brake vent	Airguard 7357
Speed mph (km/h)	4.2 (6.8)
Depth setting in. (mm)	0.25 (6)
Seed rate lb/acre (kg/ha)	4 (4.5)
Airspeed without brake fpm (m/s)	3,190 (16.2)
Airspeed with brake fpm (m/s)	1,360 (6.9)
Air hose I.D. in. (mm)	1 (25)
Air hose O.D. in. (mm)	1.25 (32)
Opener tool	Seed Master knife Opener 0.625 in. (16 mm) width
Soil type	Oxbow18
Weather data: Temp (°C), RH (%), Wind (km/h)	20.1,20,9



Figure 2 Seed depth measurement.

Additional information regarding test procedures and parameters is available upon request (address is provided at the end of this report).

3. Testing Results

Test results are summarized in **Table 3**.

Table 3. Summary of mean seed depth and percentage of seed depths within .039 in.(1mm), .19 in.(5mm), and .39 in.(10mm)of the mean depth.

	Mean depth (mm)	% of seed depths within		
		1 mm of mean	5 mm of mean	10 mm of mean
No brake	.86(22)	12	56	84
Brake	.71(18)	18	88	100

Scatterplots showing the depth of seeds for each treatment are shown in **Figure 3** through **Figure 6**. These plots allow visualization of the variability for each treatment and also show the ± 5 mm (± 0.19 in) bands.

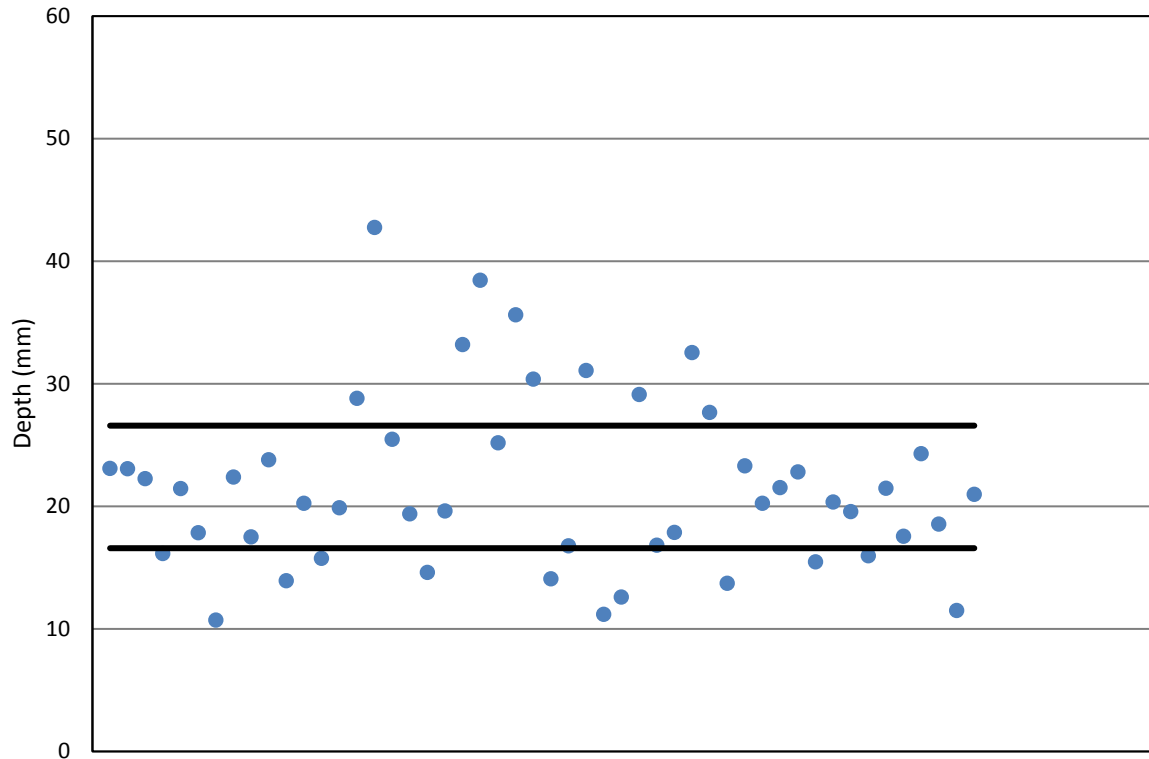


Figure 3. The depth of canola placed with a hoe opener and no seed brake (50 readings). The black lines represent ± 5 mm of the mean depth. 56% of readings were within 5 mm of the mean.

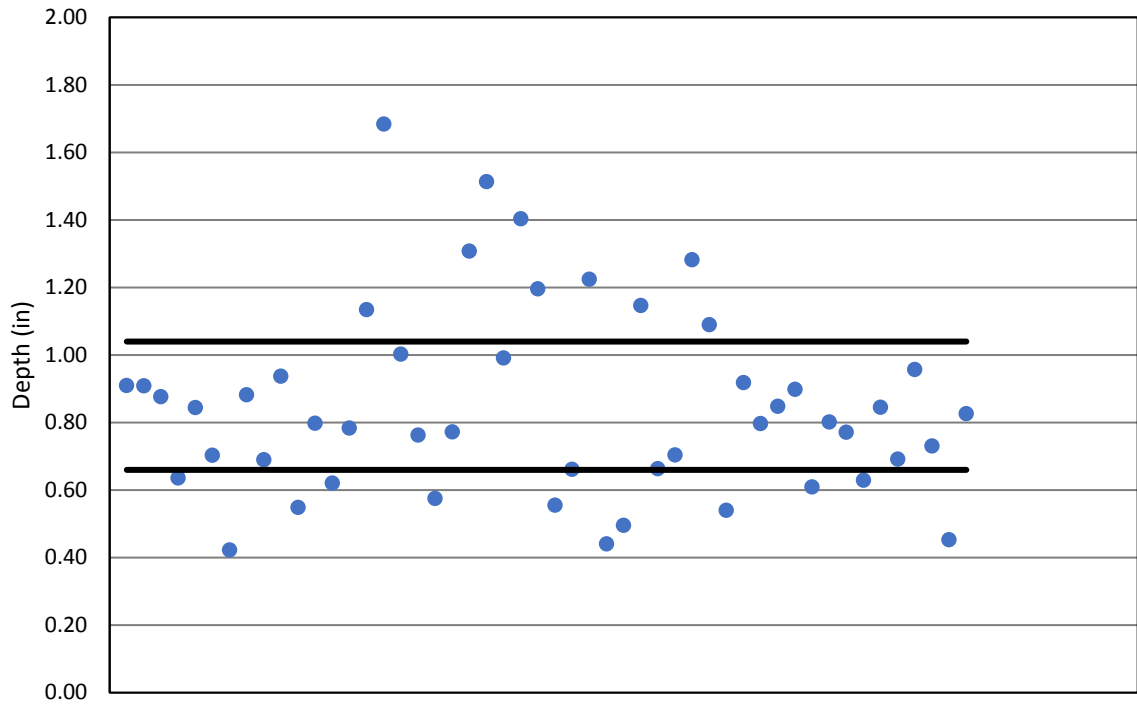


Figure 4. The depth of canola placed with a hoe opener and no seed brake (50 readings). The black lines represent ± 0.19 in. of the mean depth. 56% of readings were within .19 in. of the mean.

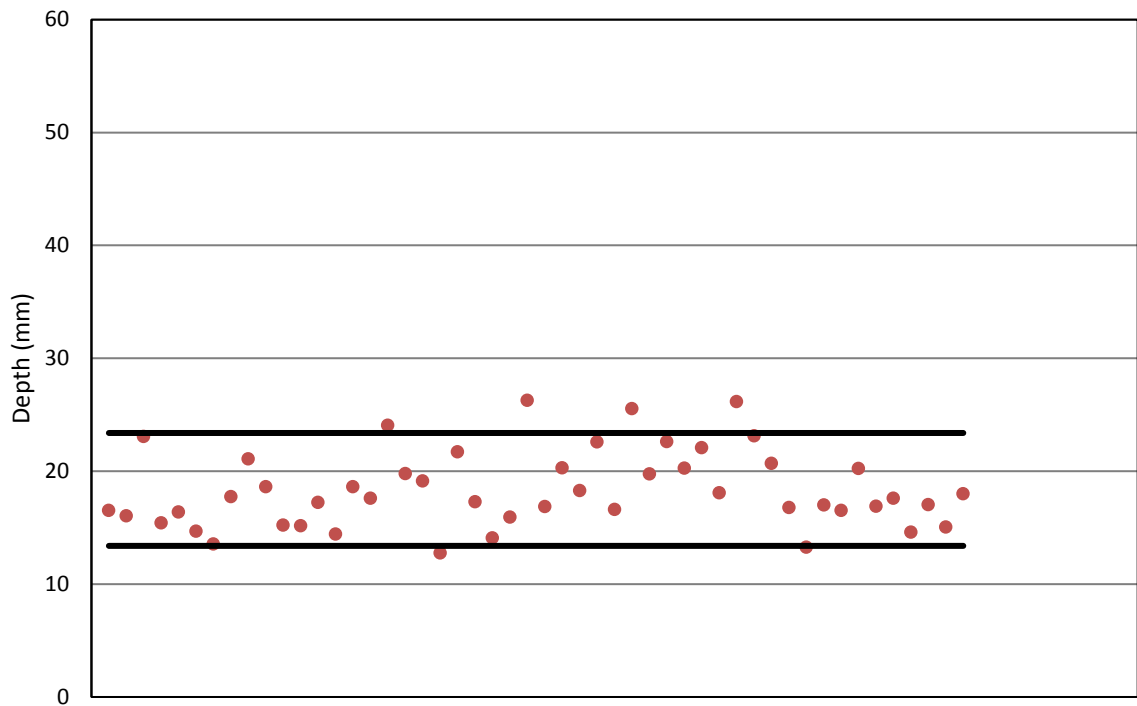


Figure 5. The depth of canola placed with a hoe opener and with a seed brake (50 readings). The black lines represent ± 5 mm of the mean depth. 88% of readings were within 5 mm of the mean.

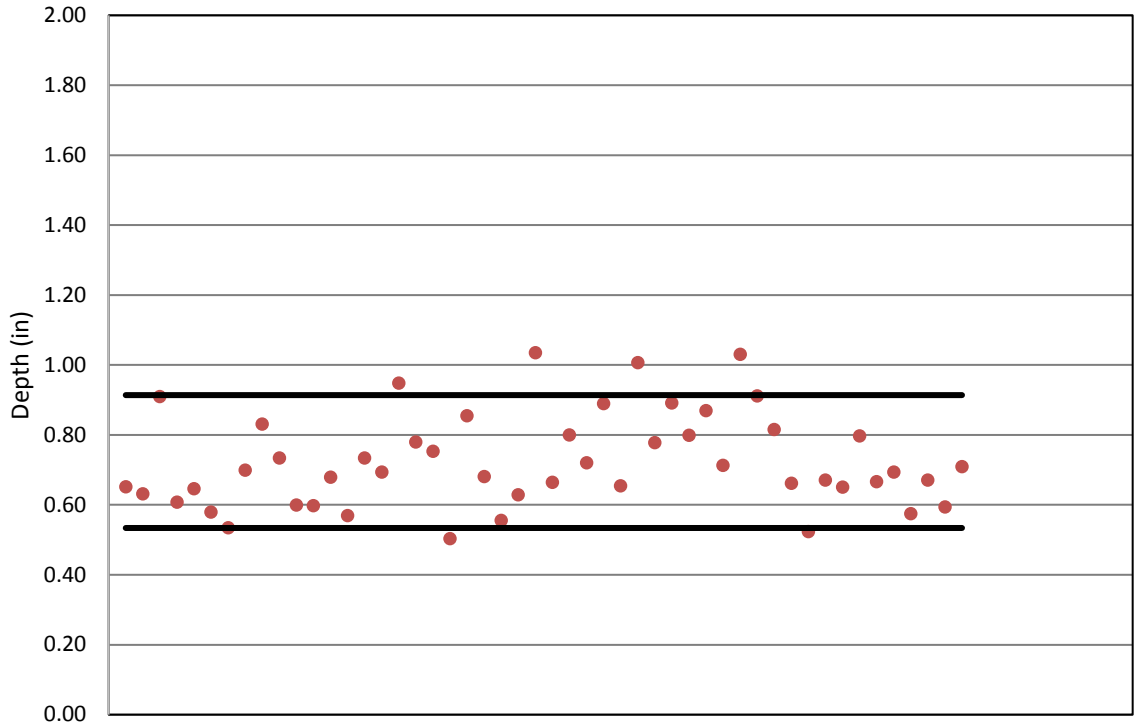


Figure 6. The depth of canola placed with a hoe opener and with a seed brake (50 readings). The black lines represent $\pm .19$ in. of the mean depth. 88% of readings were within .19 in. of the mean.

An analysis of variance using the Bonett method was applied to determine if the seed brake produces a more uniform seed depth. A confidence level of 95% was used to determine significant differences.

Table 4 shows the results using the Bonett’s test of variance at a 95% confidence level. **Appendix A** contains the statistical analysis for the canola opener trial.

Table 4. The Bonett test of variance results.

	Mean Depth in. (mm)	Min Depth in. (mm)	Max Depth in. (mm)	StDev in. (mm)	Difference in variability of depth with brake	P Value
No brake	0.9 (22)	0.4 (11)	1.7 (43)	0.3 (7)	Yes	0.001
Brake	0.7 (18)	0.5 (13)	1.0 (26)	0.1 (3)		

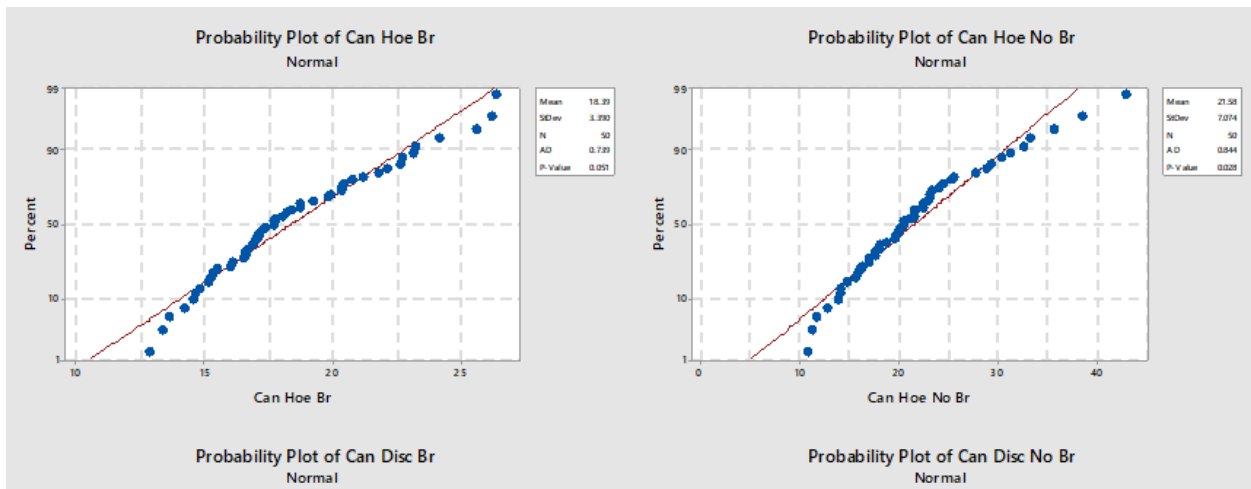
This analysis indicates that the use of a seed brake resulted in a statistically significant reduction in the variability of seed depth for canola placed with a hoe opener (at a 95% confidence level).

Appendix A

Statistical Analysis of Canola using a Hoe

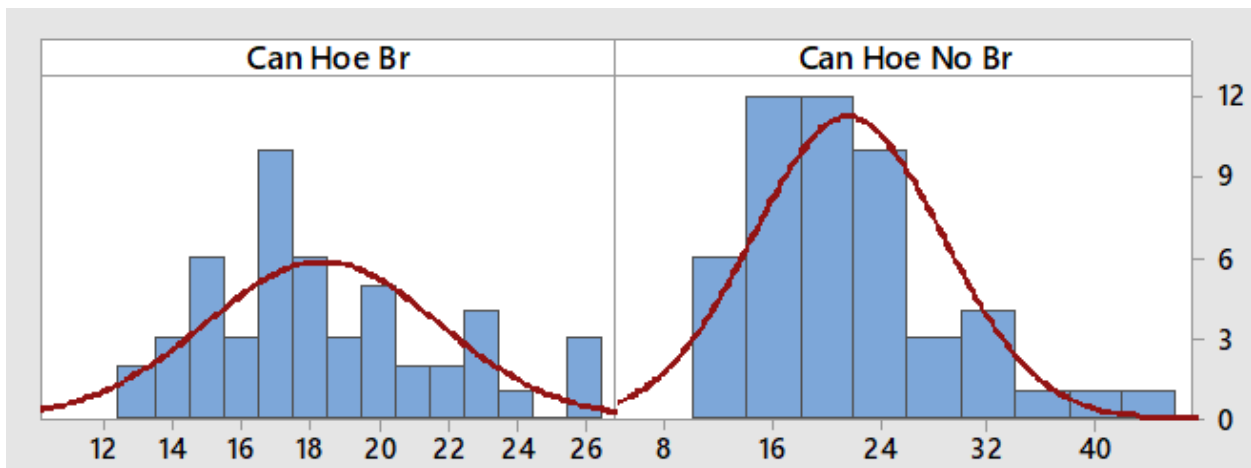
Descriptive Statistics

Variable	Mean	SE Mean	StDev	Variance	CoefVar	Minimum	Maximum
Can Hoe No Br	21.58	1.00	7.07	50.04	32.77	10.73	42.77
Can Hoe Br	18.386	0.479	3.390	11.492	18.44	12.780	26.290



Frequency Histogram

Treatment	Mean	StDev	N
No Brake	21.58	7.074	50
With Brake	18.39	3.390	50



Test and Confidence Interval (CI) for Two Variances for Hoe Opener Method

σ_1 : standard deviation of Can Hoe No Br

σ_2 : standard deviation of Can Hoe Br

Ratio: σ_1/σ_2

The Bonett and Levene's methods are valid for any continuous distribution.

Descriptive Statistics

Variable	N	StDev	Variance	95% CI for σ
Can Hoe No Br	50	7.074	50.044	(5.605, 9.293)
Can Hoe Br	50	3.390	11.492	(2.826, 4.232)

Ratio of Standard Deviations

Estimated Ratio	95% CI for Ratio using Bonett	95% CI for Ratio using Levene
2.08674	(1.462, 2.844)	(1.383, 2.829)

Test

Null hypothesis $H_0: \sigma_1 / \sigma_2 = 1$

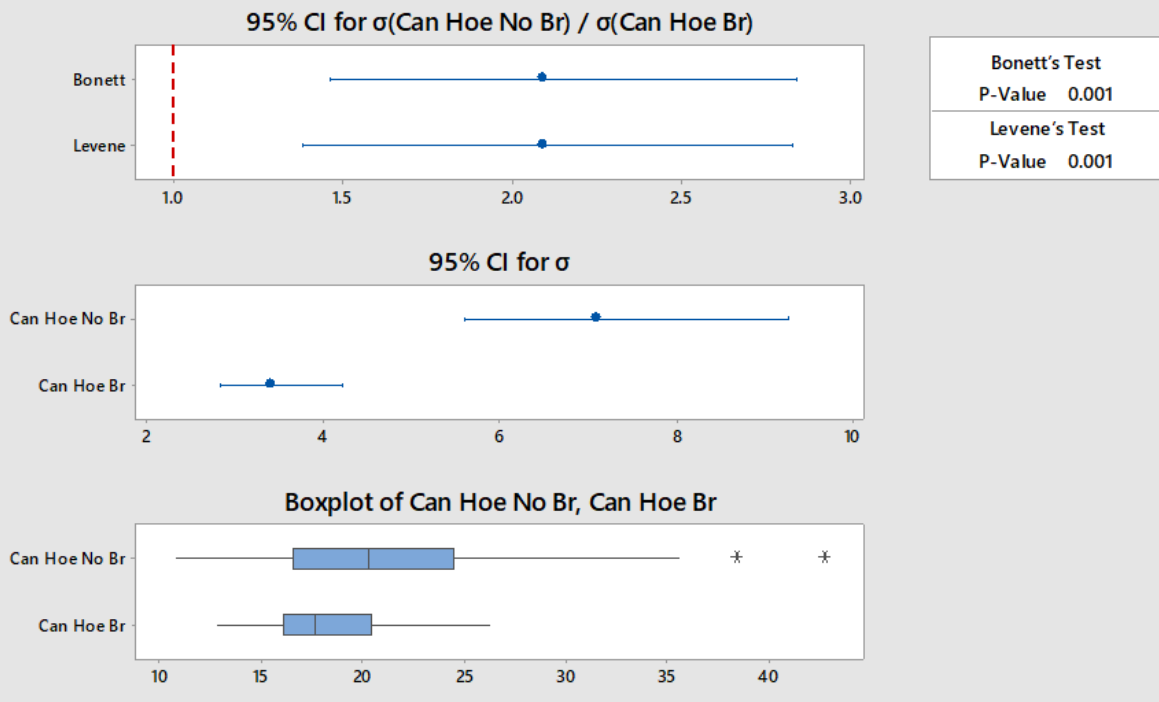
Alternative hypothesis $H_1: \sigma_1 / \sigma_2 \neq 1$

Significance level $\alpha = 0.05$

Method	Test			
	Statistic	DF1	DF2	P-Value
Bonett	11.83	1		0.001
Levene	12.14	1	98	0.001

Test and CI for Two Variances: Can Hoe No Br, Can Hoe Br

Ratio = 1 vs Ratio \neq 1



For further information with regards to this report, please contact PAMI at the Saskatchewan Operations address below.
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