2019 Research Report

from the

East Central Research Foundation

Project Title: Maintaining Test Weight Stability of Milling Oats
(ADOPT# 20180443)

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Project Identification

1. **Project Title:** Maintaining Test Weight Stability of Milling Oats
2. **Project Number:** 20180443
3. **Producer Group Sponsoring the Project:** Saskatchewan Oat Development Commission
4. **Project Location(s):** Yorkton, Melfort, and Indian Head SK
5. **Project start and end dates (month & year):** April 2019 to February2020
6. **Project contact person & contact details:**

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Objectives and Rationale

7. **Project objectives:**

The objectives of this study are to demonstrate the following:

- Test weights and other quality factors for milling oats tend to worsen with delayed seeding and increasing nitrogen rates.
- Test weight stability can vary between varieties. Seeding early and managing nitrogen is particularly critical for a low test weight variety such as CS Camden compared to Summit

8. **Project Rationale:**

The majority of Saskatchewan's oats are sold into the milling market making quality a top priority. To achieve milling quality, producers need to seed early and manage nitrogen to maintain adequate test weights. This is particularly important for lower test weight varieties. Now that preharvest glyphosate is no longer a harvest aid option for some milling oats, crops should be seeded earlier to ensure oats can be harvested before weathering reduces quality.

Studies conducted at Indian Head, Melfort and Canora by Agriculture Canada examined the impact of seeding date, nitrogen (N) rate and cultivar on oat yield and milling quality [1]. The researchers found oats should be seeded mid-May with an N rate between 40 and 80 kg/ha. When seeding was delayed to early June, only 40 kg N/ha should be applied to maintain oat quality. The specific effects of higher N rate on oat quality were lower test weight, kernel size and groat yield, fewer plump seeds and more thin seeds. These observations were also later supported by Lafond et al. in 2013 [2].

Test weight stability as N is added can differ between varieties. Summit and CS Camden are both recommended varieties by Grain Millers. CS Camden is the higher yielding variety but it has lower test weights. According to the Saskatchewan Seed Guide, tests weights average 256 and 242 g/0.5L for Summit and CS Camden, respectively [3]. Millers generally prefer tests weights over 245 g/0.5L. Recent studies lead by Bill May found Summit had good test weight stability to increasing rates of nitrogen and was similar to the check variety Stride at Yorkton. In contrast, test weights of CS Camden were poorer than those of the check variety Stride when tested at Indian Head[4] and were at border line levels of acceptance levels.

The yield of Summit can be pushed by higher rates of N with less risk of reducing test weights to discounted levels compared to CS Camden.

[1] May, W., Mohr, R., Lafond, G., Johnston, A. and C. Stevenson. 2004b. Effect of nitrogen, seeding date and cultivar on oat quality and yield in the eastern Canadian Prairies. Can. J. Plant Sci. 84: 1025-1036.

[2] Lafond, G., May, W. and C. Holzapfel. 2013. Row Spacing and Nitrogen Fertilizer Effect on No-Till Oat Production. Agron. J. 105: 1-10.

[3] Varieties of Grain Crops 2018. Government of Saskatchewan.

[4] May, B Yield Response and Test Weight Stability of Oat to Fertilizer N. Adopt 201504418

Methodology and Results

9. Methodology:

Trials were established at Yorkton, Melfort and Indian Head as a split-split-plot with 3 factors and 4 replicates. The main-plot factor contrasted early May (early) vs early June (late) seeding dates. The sub-plot factors were Variety and the sub-subplot was Nitrogen rate. The varieties CS Camden and Summit were compared at nitrogen rates of 40, 80 and 120 kg N/ha. Treatments are listed in Table 1. Plots at Yorkton were 11 by 30 feet and seeded with a 10 foot SeedMaster drill on 12 inch row spacing. The middle 4 rows of each plot was harvested with a Wintersteiger plot combine. Plots were handled similarly at Indian Head and Melfort. Other macro nutrients apart from nitrogen were applied so as to be non-limiting.

Table 1. Treatment List for Maintaining Acceptable Test Weights for Milling Oats.			
Trt #	**Seeding Date**	**Variety**	**Kg N/ha**
1	Early May (early)	CS Camden	40
2	Early May (early)	CS Camden	80
3	Early May (early)	CS Camden	120
4	Early May (early)	Summit	40
5	Early May (early)	Summit	80
6	Early May (early)	Summit	120
7	Early June (late)	CS Camden	40
8	Early June (late)	CS Camden	80
9	Early June (late)	CS Camden	120
10	Early June (late)	Summit	40
11	Early June (late)	Summit	80
12	Early June (late)	Summit	120

Table 2. Dates of operations in 2019.			
Operations in 2019	**Indian Head**	**Melfort**	**Yorkton**
Pre-seeding Herbicide Application	May 12 Roundup Weathermax 540 (0.67L/ac) all plots	May 24 Glyphosate540 (0.5L/ac) + Heat LQ (21mL/ac) + Merge (400mL)	n/a
Early May Seeding Date	May 3	May 14	May 10
Early June Seeding Date	May 29	June 12	May 31
Emergence Counts	May 28 & June	June 18 & July 3	May 30 & June 17
In-crop Herbicide Application	June 13 (early seeding) and June 26 (late seeding) Prestige XC A (0.17 l/ac) + Prestige XC B (0.8 l/ac)	July 4 Prestige XC (A@ 0.13L/ac + B@0.6L/ac) (both seedings)	June 10 Frontline (early seeding) June 25 MCPA (both seedings) July 3 MCPA (late seeding)
Fungicide Application	July 3 (early seeding) and July 9 (late seeding) Trivepro A (0.4 l/ac) + Trivepro B (0.12 l/ac)	July 12 Acapella @ (325mL/ac) (both seedings)	July 3 Caramba 280ml/ac (early seeding) July 14 Caramba 400ml/ac (late seeding)
Lodging	August 27 (early seeding) and September 4 (late seeding)	Sept 13	Sept 3
Harvest	August 29 (early seeding) and September 8 (late seeding)	Oct 7	Sept 8 (early + rep 1 of late seeding) Sept 16 (reps 2,3 & 4 of late seeding)

10. Results:

Growing Season Weather

Mean monthly temperatures and precipitation amounts for Indian Head, Melfort and Yorkton are listed in Table 3. Rainfall and temperatures were below average at all sites.

Table 3. Mean monthly temperatures and precipitation amounts along with long-term (1981-2010) normals for the 2019 growing seasons at Indian Head, Melfort, and Yorkton in Saskatchewan.

Location	Year	May	June	July	August	Avg. / Total
		----------*Mean Temperature (°C)* ----------				
Indian Head	2019	8.9	15.7	17.4	15.8	14.4
	Long-term	***10.8***	***15.8***	***18.2***	***17.4***	***15.6***
Melfort	2019	8.8	15.3	16.9	14.9	14.0
	Long-term	***10.7***	***15.9***	***17.5***	***16.8***	***15.2***
Yorkton	2019	8.6	16	18.3	16.1	14.8
	Long-term	***10.4***	***15.5***	***17.9***	***17.1***	***15.2***
		---------- *Precipitation (mm)* ----------				
Indian Head	2019	13.3	50.4	53.1	96.0	212.8
	Long-term	***51.7***	***77.4***	***63.8***	***51.2***	***241.4***
Melfort	2019	18.8	87.4	72.7	30.7	209.6
	Long-term	***42.9***	***54.3***	***76.7***	***52.4***	***226.3***
Yorkton	2019	11.1	81.6	49.1	32.2	174
	Long-term	***51***	***80***	***78***	***62***	***272***

Soil N was at moderate levels at Indian Head and Melfort and somewhat lower at Yorkton (Table 4).

Table 4. Soil Test Nitrate Levels for each location.

Nitrate Levels (lbs NO_3-N/ac)	**Indian Head**	**Melfort**	**Yorkton**
0-15cm (0-6in)	13.4 lb/ac	15 lb/ac	14 lb/ac
15-30cm (6-12in)		15 lb/ac	
15-60cm (6-24in)	30.3 lb/ac		18 lb/ac
Total 0-60cm (0-24in)	43.7 lb/ac		32 lb/ac
Total 0-60cm (0-12in)		30 lb/ac	

Plant emergence was excellent at Yorkton and Indian Head for both seeding dates. Emergence at Indian Head was somewhat higher when seeding early compared to late (316 vs 257 plants/m^2) (Table 6). In contrast, fewer plants (278 vs 339 plants/m^2) emerged when seeding oat early compared to late at Yorkton. At Melfort, emergence was substantially lower with the early seeding date. Only 95 plants/m^2 emerged when oats were seeded early due to dry soil conditions. More soil moisture was available when seeding late allowing for a better stand establishment of 275 plants/m^2. Emergence tended to decline somewhat at all locations as the rate of side-banded nitrogen was increased which is not unusual. The goal was to achieve similar emergence rates between varieties and this was somewhat accomplished at Yorkton and Indian Head with CS Camden having only 8% higher emergence than Summit at both locations. In contrast, the relative emergence of Summit was considerably poorer at Melfort. Only 158 plants/m^2 emerged for Summit compared to 213 plants/m^2 for CS Camden, a difference of 26%. However, the lower emergence of Summit did not appear to be detrimental to yield as it still yielded more than CS Camden. Differences in emergence rates likely had only modest effects on oat yield and quality.

Past research has found oat yield and grain test weight are more likely to be higher with earlier seeding. Early seeding (May 14) did result in 2.9% more yield at Melfort compared to late seeding on June 12, but the difference was insignificant (Tables 8 and 9). At Yorkton, seeding early (May 10) produced 6.2% less yield than seeding late (May 31), which is the opposite of expectations but the difference was not statistically significant. At Indian Head, there was a significant interaction between seeding date and variety. While seeding early (May 3) did result in higher yield for CS Camden, Summit produced its highest yield when seeded late (May 29) (Table 10a). It is uncertain why this would occur. Again, test weight was expected to be higher with earlier seeding and this only occurred significantly at Indian Head (Tables 11 and 12). At Melfort and Yorkton, test weights were numerically higher for the late seeding date with the

difference being statistically significant at Melfort. While seeding early should increase the likelihood of harvesting quality grain before weathering, it does not seem to guarantee yields and test weights will be higher.

Increasing N was anticipated to increase oat yield and reduce test weights. For the most part this was observed in this study. On average, raising N rate from 40 to 120 kg N/ha significantly increased yield by 18 and 34% at Yorkton and Melfort, respectively (Tables 8 and 9). At Indian Head, yield response to added N was a little unusual as a significant interaction between seeding date and nitrogen rate were detected. For the early seeding date, yield peaked at 80 Kg N/ha and declined with 120 Kg N/ha (Table 10b). When seeded late, oat yield increased with added N but at a modest and insignificant rate. Yield potential was moderate at Indian Head and soil N levels were moderate with 44 lb N/ac in the top 24 inches of soil (Table 4). This may account for the low yield response to added N. As anticipated, test weights were significantly reduced by increasing N at Indian Head and Yorkton (Tables 8 and 9). However, test weights were unaffected by rate of N at Melfort.

Test weights for Summit were expected to be significantly higher than CS Camden at the same rate of applied N and this was certainly the case for all sites (Table 11 and 12). Overall, test weights were low at Indian Head with Summit and CS Camden producing average test weights of 243.7 and 231.9 g/0.5 l, respectively. At Grain Millers in Yorkton, milling oats are discounted with tests weights below 245 g/0.5l and are rejected below 230 g/0.5l. Test weights were much higher at Yorkton and Melfort. At Yorkton, Summit again had a significantly higher test weight of 260.8 g/0.5l versus 251.9 g/0.5l for CS Camden. At Melfort, Summit produced a higher test weight of 265.9 g/0.5l compared to 261 g/0.5l for CS Camden. However, there was strong variety by seeding date interaction at Melfort. When seeded early the difference in test weights was greater with Summit and Camden having test weights of 263.2 and 255.3 g/0.5l, respectively. When seeded late, test weights were more similar with Summit and Camden having test weights of 268.6 and 266.7 g/0.5l, respectively.

Whether seeded early or late, Summit was less likely to be discounted or rejected than CS Camden on the basis of test weight as N rates were increased at all sites (Table 13). When seeded early at Indian Head, CS Camden would have been discounted at all nitrogen rates. In contrast, Summit would not have been discounted until 120 kg N/ha were applied. When seeded late at Indian Head, test weights were even lower and discounts would have been worse. CS Camden would have been rejected at N rates of 80 kg/ha and above. In contrast, Summit would not have been rejected at any rate of N. At Yorkton, test weights were much higher (Table 13). While none of the treatments would have produced oats with test weights low enough to be discounted, Summit maintained higher test weights than CS Camden at all rates of N. When seeded early, CS Camden came close to being discounted with a test weight of 246.0 g/0.5L when fertilized with 120 kg N/ha. In comparison, Summit produced a much higher test weight of 254.5 g/0.5L at this rate of N. When seeded late, tests weight were higher and did not come close to discount levels even at the highest rate of N. With 120 kg/ha of added N, CS Camden produced a test weight of 254.2 g/0.5L but again Summit produced an even higher test weight of 261.8 g/0.5L. At Melfort, test weights were very high (254 g/0.5l +) and no treatment resulted in a test weight low enough

to trigger a discount. Nitrogen rate did not influence test weight however, Summit consistently had higher test weights compared to CS Camden at every nitrogen rate within a seeding date. Seeding late at Melfort increased test weight by 3.2% when averaged over nitrogen rate and variety. The results from all the sites clearly indicate that Summit can maintain higher tests weights than CS Camden when yields are pushed with higher rates of N.

The following economic assessments below have been made assuming $3.23/bu for Oats and $0.50/lb N. Based on information supplied by Grain Millers, oats were discounted as follows:

- $0.02/bu for test weights between 245 and 240 g/0.5l.
- $0.04/bu for test weights between 240 and 235 g/0.5l
- $0.08/bu for test weights between 235 and 230 g/0.5l.
- Rejection for test weights below 230 g/05l.

At Melfort, Summit had higher test weights than CS Camden, particularly when seeded early. However, test weights were never low enough to discount the oats. As N had the largest significant effect on yield, the economic analysis is based on yields and test weights for each rate of N averaged over seeding date and variety (Table 14). The highest rate of N (120 kg/ha or 107 lb/ac) provided the greatest gross return. The gross returns from Melfort were higher than any of the other sites. However, test weights were high and unaffected by N rate which is not typical and was not the case for Indian Head and Yorkton.

At Indian Head there were interactions with the yield data and every factor had a significant effect on test weight. As a result, the economic analysis had to be done for every individual treatment (Tables 15a-d). Overall, economic returns were smaller at Indian Head compared to Melfort as yields were lower and fairly unresponsive to added N. Moreover, test weights were lower and in many cases this resulted in discounts and even rejection of oats for milling. When seeded early (Tables 15a and b), 80 kg/ha (71 lb/ac) of N was most economical for both varieties and provided similar returns. However, there was clearly more risk to growing CS Camden as it was discounted at every rate of N due to low test weight. In contrast, test weights for Summit were higher and did not reach discount levels until the highest rate of N was applied. When seeded late (Tables 15c and d), test weights were lower which is in keeping with past research. This resulted in rejection of CS Camden for milling at N rates of 80 kg/ha (71 lb/ac) and above. Again, Summit test weights were higher but discounts were received at every rate of N. For both varieties the most economical rate of N was only 40 kg/ha (36 lb/ac) when seeded late.

For Yorkton, the economical analysis has been averaged over seeding date, as seeding date did not significantly affect yield or test weights (Table 16 a and b). Yields were more responsive to added N at Yorkton compared to Indian Head and yields were also higher, though not as high as Melfort. While test weights for CS Camden were less than Summit, discounts based on low test weight did not occur regardless of variety and rate of N. For Summit, the most economical rate of N was 80 kg/ha (71 lb/ac) whereas, 120 kg/ha (107 lb/ac) of N was most economical for CS

Camden. However, the difference in the rate of return between those two rates of N was very small for both varieties.

The trial was viewed at the Yorkton main farm tour on July 23, 2019 (100 attendees) and at an industry tour involving 40 producers. A video has been recently posted covering the results and can be found at www.ecrf.ca. As of Jan 13, it has been viewed 99 times. The trial was toured at the Indian Head Crop Management Field Day on July 16 where 125 people attended. The trial was also mentioned in an article called "Test Weights for Milling Oats" by The Oat Scoop.

11. Conclusions and Recommendations

Seeding early is recommended for milling oats to help maximize yield and test weights. However, yields and test weights were not always higher with early seeding in this study. This would indicate that seeding early does not guarantee environmental conditions will always be conducive for greater yield and test weight. As anticipated, increasing rates of N from 40 to 120 kg/ha reduced test weights at Indian Head and Yorkton. Moreover, Summit clearly maintained higher test weights than CS Camden at equivalent rates of N at all locations. This means the yield of Summit can be pushed with higher rates of N and with less risk of being discounted on the basis of test weight compared to CS Camden. It is hard to recommend an N rate that would be appropriate for every producer. However, 80 kg N/ha (71 lb N/ac) generally did not result in rejection for milling and often produced economic returns which were close to the maximum possible. To minimize the risk of rejection due to low test weight, Summit should be grown instead of CS Camden. However, if lodging had been an issue in this study CS Camden may have performed relatively better as its lodging resistance is higher compared to Summit. While seeding late did not guarantee higher test weights, it is still a good practice as early seeding will likely favor harvest under ideal conditions.

Supporting Information

12. Acknowledgements:

This project was funded through the Agricultural Demonstrations of Practices and Technologies.

13. Appendices

Table 5. Significance of seeding date, variety, and nitrogen fertilizer rate effects on oat emergence at multiple locations in 2019.

	Emergence		
	Indian Head	**Melfort**	**Yorkton**
Effect	----------p-values [z] ----------		
Seeding Date (D)	0.051407	0.00096	0.003077
Variety (V)	NS	0.002381	0.024532
D x V	NS	NS	NS
Nitrogen rate (R)	0.005921	NS	NS
D x R	NS	NS	NS
V x R	NS	NS	NS
D x V x R	NS	NS	NS

[z] p-values ≤ 0.05 indicate that a treatment effect was significant and not due to random variability

Table 6. Main effects of seeding date, variety, and nitrogen fertilizer rate on oat emergence at multiple locations in 2019.

Main effect		**Emergence**	
	Indian Head	**Melfort**	**Yorkton**
Seeding Date	---------- plant/m^2 ----------		
Early May (early)	316	95	278
Early June (late)	257	275	339
LSD	NS	44	22
Variety			
CS Camden	298	213	320
Summit	274	158	297
LSD	NS	26	19
kg N/ha			
40	305	198	312
80	277	191	310
120	277	167	303
LSD	18	NS	NS

Table 7. Seeding Date by Variety by N fertilizer rate interactions on oat emergence at multiple locations in 2019.			
Main effect	**Emergence**		
	Indian Head	**Melfort**	**Yorkton**
D × V x R	---------- plant/m^2 ----------		
Early May – CS Camden – 40 Kg N/ha	352	167	282
Early May – CS Camden – 80 Kg N/ha	305	127	290
Early May– CS Camden – 120 Kg N/ha	319	95	281
Early May - Summit– 40 kg N/ha	327	75	283
Early May- Summit– 80 Kg N/ha	298	68	264
Early May - Summit– 120 Kg N/ha	293	42	268
Early June– CS Camden – 40 Kg N/ha	277	308	343
Early June– CS Camden – 80 Kg N/ha	268	305	373
Early June– CS Camden – 120 Kg N/ha	268	274	351
Early June- Summit– 40 kg N/ha	263	241	341
Early June- Summit– 80 Kg N/ha	238	266	314
Early June- Summit– 120 Kg N/ha	228	258	313
L.S.D			
R means for same D and V	37	57	50
V means for same D and same or different R	53	60	49
D means for same or different V and R	79	83	62

Table 8. Significance of seeding date, variety, and nitrogen fertilizer rate effects on oat yield at multiple locations in 2019.

	Yield		
	Indian Head	**Melfort**	**Yorkton**
Effect	----------p-values [z] ----------		
Seeding Date (D)	NS	NS	NS
Variety (V)	NS	NS	0.048403
D x V	0.005152	NS	NS
Nitrogen rate (R)	0.012454	<0.00001	<0.00001
D x R	0.014263	0.036837	NS
V x R	NS	NS	NS
D x V x R	NS	NS	NS

[z] p-values ≤ 0.05 indicate that a treatment effect was significant and not due to random variability

Table 9 Main effects of seeding date, variety, and nitrogen fertilizer rate on oat yield at multiple locations in 2019.

Main effect	**Yield**		
	Indian Head	**Melfort**	**Yorkton**
Seeding Date	---------- kg/ha ----------		
Early May (early)	4477	7073	6439
Early June (late)	4563	6876	6859
LSD	NS	NS	NS
Variety			
CS Camden	4474	6950	6531
Summit	4566	6999	6767
LSD	NS	NS	180
kg N/ha			
40	4391	5821	5999
80	4607	7277	6854
120	4562	7826	7094
LSD	124	356	198

Table 10. Seeding Date by Variety by N fertilizer rate interactions on oat yield at multiple locations in 2019.			
Main effect	**Yield**		
	Indian Head	**Melfort**	**Yorkton**
D × V x R	---------- kg ha^{-1} ----------		
Early May – CS Camden – 40 Kg N/ha	4364	5704	5565
Early May – CS Camden – 80 Kg N/ha	4724	7474	6578
Early May– CS Camden – 120 Kg N/ha	4586	8035	6871
Early May - Summit– 40 kg N/ha	4153	6377	5785
Early May- Summit– 80 Kg N/ha	4606	7580	6803
Early May - Summit– 120 Kg N/ha	4432	7269	7030
Early June– CS Camden – 40 Kg N/ha	4330	5583	6133
Early June– CS Camden – 80 Kg N/ha	4421	6948	6817
Early June– CS Camden – 120 Kg N/ha	4419	7954	7220
Early June- Summit– 40 kg N/ha	4717	5619	6512
Early June- Summit– 80 Kg N/ha	4678	7105	7221
Early June- Summit– 120 Kg N/ha	4812	8046	7254
L.S.D			
R means for same D and V	247	712	395
V means for same D and same or different R	286	819	410
D means for same or different V and R	371	995	816

Table 10a. Yield for the Seeding Date by Variety interaction for Indian Head	
D x V	**IHARF Yield**
	---------- kg/ha ----------
Early May - CS Camden	4557.8
Early May - Summit	4396.8
Early June – CS Camden	4389.7
Early June - Summit	4735.4
L.S.D	
V1D1-V2D1	204.2
V1D1-V1D2 or V1D1-V2D2	245.7

Table 10b. Yield Means for the Seeding Date by N Rate Interaction for Indian Head	
D x R	**IHARF Yield**
	---------- kg/ha ----------
Early May – 40 kg N/ha	4258.3
Early May – 80 kg N/ha	4664.9
Early May – 120 kg N/ha	4508.9
Early June – 40 kg N/ha	4523.1
Early June – 80 kg N/ha	4549.3
Early June– 120 kg N/ha	4615.3
L.S.D	
R means for same D	175.0
D means for same or different R	234.0

Table 11. Significance of seeding date, variety, and nitrogen fertilizer rate effects on oat test weight at multiple locations in 2019.

	Test Weight		
	Indian Head	**Melfort**	**Yorkton**
Effect	----------p-values [z] ----------		
Seeding Date (D)	0.027556	0.001008	NS
Variety (V)	0.00692	<0.00001	0.000625
D x V	NS	0.00011	NS
Nitrogen rate (R)	0.001932	NS	0.00295
D x R	NS	NS	NS
V x R	NS	0.049721	NS
D x V x R	NS	NS	NS

[z] p-values ≤ 0.05 indicate that a treatment effect was significant and not due to random variability

Table 12. Main effects of seeding date, variety, and nitrogen fertilizer rate on oat test weight at multiple locations in 2019.

Main effect	**Test Weight**		
	Indian Head	**Melfort**	**Yorkton**
Seeding Date	---------- g/0.5L ----------		
Early May (early)	241.2	259.3	253.7
Early June (late)	234.4	267.6	259.1
LSD	5.4	2.06	NS
Variety			
CS Camden	231.9	261.0	251.9
Summit	243.7	265.9	260.8
LSD	7.2	0.83	3.3
Kg N/ha			
40	240.3	264.0	259.5
80	236.9	262.8	255.5
120	236.1	263.6	254.1
LSD	2.3	NS	3.0

Table 13. Seeding Date by Variety by N fertilizer rate interactions on oat test weight at multiple locations in 2019.			
Main effect	**Test Weight**		
	Indian Head	**Melfort**	**Yorkton**
D × V x R	---------- g/0.5L ----------		
Early May – CS Camden – 40 kg N/ha	239.0	255.7	253.0
Early May – CS Camden – 80 kg N/ha	237.0	253.8	248.2
Early May– CS Camden – 120 kg N/ha	235.0	256.4	246.0
Early May - Summit– 40 kg N/ha	247.3	265.2	263.1
Early May- Summit– 80 kg N/ha	245.8	264.0	257.3
Early May - Summit– 120 kg N/ha	243.0	260.6	254.5
Early June– CS Camden – 40 kg N/ha	231.0	266.5	255.5
Early June– CS Camden – 80 kg N/ha	222.8	265.5	254.6
Early June– CS Camden – 120 kg N/ha	226.5	268.0	254.2
Early June- Summit– 40 kg N/ha	244.0	268.6	266.4
Early June- Summit– 80 kg N/ha	242.0	267.9	262.0
Early June- Summit– 120 kg N/ha	240.0	269.3	261.8
LSD			
R means for same D and V	4.6	NS	6.0
V means for same D and same or different R	10.8	NS	6.8
D means for same or different V and R	10.0	NS	14.3

Table 14. Oat Economics for Melfort 2019, Averaged Over Seeding Date and Variety						
Lb N/ac	Bu/ac	Test wt (g/0.5 l)	$ N/ac (@ $0.5/lb N)	$Gross/ac (@3.23/bu)	$Discount/ac	$Gross/ac-($N/ac+$Discount/ac)
36	153	262.6	18	494	0.00	476
71	191	263.6	35.5	617	0.00	582
107	205	264.2	53.5	662	0.00	609

Table 15a. Summit Oat Economics for Indian Head 2019 – Seeded Early						
Lb N/ac	Bu/ac	Test wt (g/0.5 l)	$ N/ac (@ $0.5/lb N)	$Gross/ac (@3.23/bu)	$Discount/ac	$Gross/ac-($N/ac+$Discount/ac)
36	109	247.5	18	352	0	334
71	121	245.4	35.5	390	0	354
107	116	243.2	53.5	375	2.32	319

Table 15b. CS Camden Oat Economics for Indian Head 2019 – Seeded Early						
Lb N/ac	Bu/ac	Test wt (g/0.5 l)	$ N/ac (@ $0.5/lb N)	$Gross/ac (@3.23/bu)	$Discount/ac	$Gross/ac-($N/ac+$Discount/ac)
36	115	239.0	18	370	4.58	347
71	124	237.0	35.5	401	4.96	360
107	121	235.0	53.5	390	4.83	331

Table 15c. Summit Oat Economics for Indian Head 2019 – Seeded Late						
Lb N/ac	Bu/ac	Test wt (g/0.5 l)	$ N/ac (@ $0.5/lb N)	$Gross/ac (@3.23/bu)	$Discount/ac	$Gross/ac-($N/ac+$Discount/ac)
36	124	244.0	18	400	2.47	379
71	123	242.0	35.5	397	2.46	359
107	126	240.0	53.5	408	2.53	352

Table 15d. CS Camden Oat Economics for Indian Head 2019 – Seeded Late						
Lb N/ac	Bu/ac	Test wt (g/0.5 l)	$ N/ac (@ $0.5/lb N)	$Gross/ac (@3.23/bu)	$Discount/ac	$Gross/ac-($N/ac+$Discount/ac)
36	114	231.0	18	367	9.09	340
71	116	222.8	35.5	374	reject	?
107	116	226.6	53.5	374	reject	?

Table 16a. Summit Oat Economics for Yorkton 2019 – Averaged over Seeding Date						
Lb N/ac	Bu/ac	Test wt (g/0.5 l)	$ N/ac (@ $0.5/lb N)	$Gross/ac (@3.23/bu)	$Discount/ac	$Gross/ac-($N/ac+$Discount/ac)
36	161	264.7	18	521	0	503
71	184	259.8	35.5	594	0	558
107	187	258.3	53.5	604	0	550

Table 16b. CS Camden Oat Economics for Yorkton 2019 – Averaged over Seeding Date						
Lb N/ac	Bu/ac	Test wt (g/0.5 l)	$ N/ac (@ $0.5/lb N)	$Gross/ac (@3.23/bu)	$Discount/ac	$Gross/ac-($N/ac+$Discount/ac)
36	154	254.4	18	496	0	478
71	176	251.6	35.5	568	0	533
107	185	250.6	53.5	598	0	544

Abstract

14. Abstract/Summary:

Studies were conducted in Yorkton, Indian Head and Melfort to demonstrate the impact of seeding date, variety choice and nitrogen rate on yield and test weight of oats. While increasing nitrogen increased oat yield it significantly decreased test weight. Test weight is an important grading factor and oats below 245 g/0.5L will be discounted at Grain Millers. Oats with test weights below 230 g/0.5L will be rejected. Seeding oats early is generally recommended to maximize yield and test weights. However, yields and test weights were not always higher with early seeding in this study. This would indicate that seeding early does not guarantee environmental conditions will always be conducive for greater yield and test weight. As anticipated, increasing rates of N from 40 to 120 kg/ha reduced test weights at Indian Head and

Yorkton. Moreover, Summit clearly maintained higher test weights than CS Camden at equivalent rates of N at all sites. This means the yield of Summit can be pushed with higher rates of N and with less risk of being discounted on the basis of test weight compared to CS Camden. It is hard to recommend an N rate that would be appropriate for every producer. However, 80 kg N/ha (71 lb N/ac) generally did not result in rejection for milling and often produced economic returns which were close to the maximum possible. To minimize the risk of rejection due to low test weight, Summit should be grown instead of CS Camden. The trial was viewed at the Yorkton main farm tour on July 23, 2019 (100 attendees) and an industry tour involving 40 producers. A video has been recently posted covering the results and can be found at www.ecrf.ca. As of Jan 13, the video has been viewed 99 times. The trial was toured at the Indian Head Crop Management Field day on July 16 (125 attendees). The trial was also mentioned in an article called “Test Weights for Milling Oats” by The Oat Scoop.