



## TR21665

### Two-row malting barley

- Yields 8% higher than CDC Copeland, 5% higher than AAC Synergy
- Good disease package and lodging resistance
- Balanced malting profile suitable for the adjunct brewing market

### Description

TR21665 is a promising two-row, hulled malting barley line that has shown wide adaptation across the different soil regimes in the Prairies. This line is high yielding, with yields significantly higher than both the malting checks CDC Copeland and AAC Synergy in the Western Cooperative Two-Row Barley Registration Trials in 2021 and 2022. Averaged over the two years of testing, TR21665 had 8% higher yield than CDC Copeland. TR21665 has shorter height than the checks, combined with good lodging and disease resistance packages.

TR21665 is suitable for the adjunct segment of the brewing market, with moderate protein and high enzyme levels. It has plump seeds with higher extract, DP, alpha amylase, and FAN than the checks in the 2022 and 2023 Malting Barley Collaborative Trials. This variety appears to modify relatively faster, which would be beneficial to the maltsters. Malt protein, grain peeling, beta-glucan and viscosity are lower or similar to checks, as desired.

### Strengths of TR21665

- Mean grain yield is 108% of CDC Copeland, 105% AAC Synergy.
- Plant height is 3 cm shorter than AAC Synergy, 6 cm shorter than CDC Copeland.
- Lodging scores are lower than CDC Copeland and similar to AAC Synergy.
- Good disease resistance package, with R ratings to surface borne smut and stem rust, and intermediate reactions to net-form net blotch, spot-form net blotch, spot blotch, scald, and loose smut.
- Excellent and balanced malting quality profile, with higher extract, Diastatic Power, alpha amylase, and FAN than the checks. Protein level and friability were similar to CDC Copeland, beta-glucan was lower than or in between the checks.

Approximately 500 kg of Breeder Seed is available in spring of 2025.

**Table 1a.** Yield and agronomic traits of TR21665 averaged over the 2021 and 2022 Western Cooperative Two-Row Barley Registration Trials.

Entry	Black Soil		Black/Grey Soil		Brown Soil		Overall	
	Grain Yield kg/ha	% CDC Copeland	kg/ha	% CDC Copeland	kg/ha	% CDC Copeland	kg/ha	% CDC Copeland
CDC Copeland	5046	100	5475	100	4454	100	4885	100
AAC Synergy	5240	104	5735	105	4548	102	5032	103
CDC Austenson	5496	109	5892	108	4800	108	5279	108
<b>TR21665</b>	<b>5756</b>	<b>114</b>	<b>5747</b>	<b>105</b>	<b>4584</b>	<b>103</b>	<b>5273</b>	<b>108</b>
Stn. Years	10		5		11		26	

Entry	Heading (days)	Maturity (days)	Plant Height (cm)	Lodging (1-9)	Test wt. (kg/hL)	1000 Kernel wt. (g)	Plumps >6/64 (%)	Thins < 6/64 (%)
CDC Copeland	59.0	86.8	73.8	4.2	65.0	46.3	94.5	2.0
AAC Synergy	57.5	86.6	70.6	3.2	66.2	47.4	96.0	1.4
CDC Austenson	59.4	88.2	69.3	2.3	68.1	46.6	92.8	1.9
<b>TR21665</b>	<b>58.6</b>	<b>88.3</b>	<b>67.5</b>	<b>3.1</b>	<b>65.7</b>	<b>45.4</b>	<b>93.5</b>	<b>1.9</b>
Stn. Years	27	26	31	5	29	29	27	19

**Table 1b.** Yield and agronomic traits of TR21665 averaged over the 2022 Western Cooperative Two-Row Barley Registration Trials.

Entry	Grain Yield (kg/ha)	% CDC Copeland	Head. (days)	Mat. (days)	Plant Ht. (cm)	Lodg. (1-9)	Test wt. (kg/hL)	TKW (g)	Plumps >6/64 (%)	Thins <6/64 (%)
CDC Copeland	5824	100	59.0	89.2	82.2	4.7	65.6	45.0	93.5	2.6
AAC Synergy	5862	101	57.6	89.6	77.9	3.4	67.1	47.1	95.4	1.8
CDC Austenson	6136	105	59.4	90.9	78.3	2.4	68.8	46.3	92.5	2.3
<b>TR21665</b>	<b>6092</b>	<b>105</b>	<b>59.1</b>	<b>91.2</b>	<b>74.9</b>	<b>3.1</b>	<b>66.2</b>	<b>45.4</b>	<b>92.8</b>	<b>2.3</b>
CV (%)	8.3		2.59	1.7	5.5	40.5	1.9	4.5	3.3	85.4
LSD <sub>0.05</sub>	196		0.64	0.7	1.7	1.02	0.8	1.5	2.2	1.4
Stn. Years	16		14	13	16	4	17	16	15	13

Head. = heading, Mat. = maturity, Plant Ht. = plant height, Lodg. = lodging, TKW = 1000 kernel weight.

**Table 1c.** Yield and agronomic traits of TR21665 averaged over the 2021 Western Cooperative Two-Row Barley Registration Trials.

Entry	Grain Yield (kg/ha)	% CDC Copeland	Head. (days)	Mat. (days)	Plant Height (cm)	Lodg. (1-9)	Test wt. (kg/hL)	TKW (g)	Plumps >6/64 (%)	Thins <6/64 (%)
CDC Copeland	2895	100	59.1	84.4	64.8	3.3	64.1	47.9	95.8	0.7
AAC Synergy	3387	117	57.5	83.6	62.9	2.3	64.9	47.7	96.7	0.6
CDC Austenson	3566	123	59.3	85.6	59.7	1.3	67.1	47.0	93.2	1.2
<b>TR21665</b>	<b>3554</b>	<b>123</b>	<b>58.1</b>	<b>85.5</b>	<b>59.5</b>	<b>2.3</b>	<b>65.0</b>	<b>45.5</b>	<b>94.4</b>	<b>1.2</b>
CV (%)	9.8		1.69	1.7	5.9	33.2	1.8	3.6	2.4	47.8
LSD <sub>0.05</sub>	167		0.43	0.65	1.5	1.04	1.0	1.3	1.8	0.5
Stn. Years	10		13	13	15	1	12	13	12	6

Head. = heading, Mat. = maturity, Lodg. = lodging, TKW = 1000 kernel weight.

**Table 2.** Overall disease ratings of TR21665 and the checks from the 2021 and 2022 Western Cooperative Two-Row Barley Registration Test Disease Reaction Report (prepared by K. Turkington).

Entry	Net Blotch			Smut		Stem Rust	FHB	
	Net form	Spot form	Scald	Spot blotch	Surface			Loose
CDC Copeland	MR	MS	S	I	R	I	R	I
AAC Synergy	MR	I	S	I	MR	MR	R	I
CDC Austenson	I	MS-I	MS	I	R	I	MR	I
<b>TR21665</b>	<b>I</b>	<b>I</b>	<b>I</b>	<b>I</b>	<b>R</b>	<b>I</b>	<b>R</b>	<b>MS</b>

Table 3. Disease reaction summary of TR21665 from the 2021 and 2022 Western Cooperative Two-Row Barley Registration Test.

Entry		Net Blotch					Spot Blotch				
		102	858	MBV25	Net-form	Spot-form	1903	Brandon	U of SK	Melfort	Lacombe
<b>CDC Copeland</b>	2021	3	7	7	2.5	5.5	5	2.0	.	2.0	4.0
	2022	2	4	5	0.0	4.0	5	6.0	3.0	3.5	5.0
<b>Overall</b>				<b>MR/MS</b>					<b>I</b>		
<b>AAC Synergy</b>	2021	3	6	3	0.0	3.5	3	4.0	.	1.0	2.0
	2022	2	2	7	0.0	3.0	7	4.0	2.5	1.5	4.0
<b>Overall</b>				<b>MR/I</b>					<b>I</b>		
<b>CDC Austenson</b>	2021	6	7	6	0.0	3.0	5	4.5	.	2.0	0.0
	2022	2	6	8	0.0	3.0	7	3.5	1.0	3.0	3.5
<b>Overall</b>				<b>I/MS-I</b>					<b>I</b>		
<b>TR21665</b>	2021	1	8	8	1.5	4.0	2	2.5	.	2.0	2.5
	2022	6	2	5	0.0	3.0	5	6.5	1.5	1.0	4.5
<b>Overall</b>				<b>I/I</b>					<b>I</b>		

S – susceptible, MS – moderately susceptible, I – intermediate, MR – moderately resistant, R – resistant

Table 3. Continued.

Entry		Scald			Surface Smuts			Stem Rust			
		2275	Lacombe	Edmonton	Field U of SK	AAFC-MRDC		Field		CDC <i>Rpg1</i> marker	Seedling MCC
						U. hordei	U. nigra	Coverage	Reaction		
<b>CDC Copeland</b>	2021	MS	4.0	4.5	3.2	16.0	8.0	.	.	R	1-
	2022	S	7.0	9.0	.	8.0	14.0	1	R	R	;
<b>Overall</b>			<b>S</b>			<b>R</b>			<b>R</b>		
<b>AAC Synergy</b>	2021	MS	3.0	4.5	9.2	23.0	17.5	.	.	R	;1-
	2022	S	7.0	4.5	.	34.0	37.0	1	R	R	;
<b>Overall</b>			<b>S</b>			<b>MR</b>			<b>R</b>		
<b>CDC Austenson</b>	2021	S	3.5	4.5	0.5	1.0	4.0	.	.	R	;1-
	2022	MS	7.0	8.5	.	4.0	1.0	2	MR	R	0;
<b>Overall</b>			<b>MS</b>			<b>R</b>			<b>MR</b>		
<b>TR21665</b>	2021	MS	0.0	0.5	0.6	11.0	10.0	.	.	R	;1-
	2022	MR	6.5	3.5	.	10.0	17.5	1	R	R	;
<b>Overall</b>			<b>I</b>			<b>R</b>			<b>R</b>		

S – susceptible, MS – moderately susceptible, I – intermediate, MR – moderately resistant, R – resistant

Table 3. Continued.

Entry		Fusarium Head Blight					Loose Smut	
		Rating			DON (ppm)			U. nuda
		Morden	Brandon	Charlottetown	Morden	Brandon	Average	
<b>CDC Copeland</b>	2021	1.0	1.5	.	4.0	6.5	5.3	92.9
	2022	1.3	2.0	7.7	32.3	26.6	29.4	0
<b>Overall</b>				<b>I</b>				<b>I</b>
<b>AAC Synergy</b>	2021	1.2	1.2	.	5.6	10.4	8.0	26.7
	2022	1.3	1.8	7.3	33.7	42.1	37.9	25
<b>Overall</b>				<b>I</b>				<b>MR</b>
<b>CDC Austenson</b>	2021	1.5	1.8	.	9.8	9.3	9.5	91.7
	2022	1.2	2.0	7.0	43.6	30.6	37.1	0
<b>Overall</b>				<b>I</b>				<b>I</b>
<b>[TEST##]</b>	2021	1.5	2.2	.	8.7	14.7	11.7	0
	2022	1.3	2.5	7.3	46.8	39.1	42.9	100
<b>Overall</b>				<b>MS</b>				<b>I</b>

S – susceptible, MS – moderately susceptible, I – intermediate, MR – moderately resistant, R – resistant

Table 4. Malting quality data for TR21665 from the 2022 and 2023 Western Cooperative Two-Row Barley Registration Trial.

Entry	Barley					Malt							Wort					
	Plumps		TKW	Moist.	Prot.	Chit.	Germ-out Moist.	Friab.	P&B	Prot.	DP	AA	Fine Ext.	Sol. Prot.	Kol. Index	FAN	B-Glu	Visc.
	>7/64	>6/74																
<b>2022 Mean</b>																		
CDC Copeland	67.4	95.9	48.5	9.4	11.7	99	43.1	90.0	5.7	11.4	154	65.0	80.7	4.86	42.0	203	75	1.47
AAC Synergy	75.8	96.9	49.3	9.4	12.1	96	43.3	88.4	7.3	11.6	160	77.8	81.7	5.15	44.2	215	64	1.45
<b>TR21665</b>	<b>59.4</b>	<b>93.6</b>	<b>44.2</b>	<b>9.2</b>	<b>11.4</b>	<b>95</b>	<b>43.6</b>	<b>88.1</b>	<b>5.9</b>	<b>11.4</b>	<b>164</b>	<b>81.6</b>	<b>81.9</b>	<b>5.40</b>	<b>46.7</b>	<b>246</b>	<b>72</b>	<b>1.45</b>
<b>2022 SD</b>																		
CDC Copeland	10.0	2.0	4.2	2.0	1.0	2	0.3	5.5	4.3	0.9	11	5.2	1.1	0.36	3.8	26	34	0.02
AAC Synergy	6.4	1.3	3.8	1.9	0.8	4	0.5	8.2	5.8	1.1	19	11.4	1.1	0.30	4.4	37	35	0.03
<b>TR21665</b>	<b>7.7</b>	<b>3.1</b>	<b>3.3</b>	<b>1.3</b>	<b>0.8</b>	<b>4</b>	<b>1.7</b>	<b>8.5</b>	<b>2.7</b>	<b>1.0</b>	<b>22</b>	<b>14.6</b>	<b>1.4</b>	<b>0.76</b>	<b>3.7</b>	<b>55</b>	<b>43</b>	<b>0.04</b>
<b>2023 Mean</b>																		
CDC Copeland	56.9	93.3	48.3	9.7	12.2	84	43.3	82.4	1.8	12.0	158	68.2	80.7	5.28	44.4	221	90	1.45
AAC Synergy	73.2	95.5	50.7	10.0	12.1	97	44.0	79.3	1.5	12.3	154	77.9	81.1	5.21	42.4	221	69	1.44
<b>TR21665</b>	<b>61.4</b>	<b>92.9</b>	<b>47.7</b>	<b>9.9</b>	<b>11.9</b>	<b>88</b>	<b>44.0</b>	<b>83.9</b>	<b>2.1</b>	<b>11.7</b>	<b>158</b>	<b>81.0</b>	<b>81.4</b>	<b>5.47</b>	<b>46.7</b>	<b>249</b>	<b>49</b>	<b>1.45</b>
<b>2023 SD</b>																		
CDC Copeland	14.0	4.4	3.4	1.1	0.9	24	2.6	14.8	1.0	1.2	18	9.7	1.5	0.66	5.5	38	73	0.02
AAC Synergy	10.4	2.2	3.0	1.2	0.7	5	2.4	13.7	0.4	0.7	27	13.7	1.4	0.78	4.9	44	61	0.03
<b>TR21665</b>	<b>19.3</b>	<b>7.2</b>	<b>5.3</b>	<b>1.2</b>	<b>0.9</b>	<b>18</b>	<b>2.4</b>	<b>9.8</b>	<b>1.0</b>	<b>1.2</b>	<b>27</b>	<b>14.2</b>	<b>1.2</b>	<b>0.70</b>	<b>4.9</b>	<b>43</b>	<b>28</b>	<b>0.05</b>
<b>2022/2023 Mean</b>																		
CDC Copeland	62.2	94.6	48.4	9.5	12.0	93	43.3	86.2	3.1	11.7	156	66.4	80.7	5.05	43.1	211	82	1.46
AAC Synergy	74.5	96.2	50.0	9.7	12.1	96	43.7	83.9	3.4	11.9	157	77.8	81.4	5.17	43.4	218	66	1.44
<b>TR21665</b>	<b>60.4</b>	<b>93.2</b>	<b>45.9</b>	<b>9.5</b>	<b>11.6</b>	<b>92</b>	<b>43.8</b>	<b>86.0</b>	<b>3.4</b>	<b>11.5</b>	<b>161</b>	<b>81.3</b>	<b>81.7</b>	<b>5.43</b>	<b>46.7</b>	<b>247</b>	<b>62</b>	<b>1.45</b>
<b>2022/2023 SD</b>																		
CDC Copeland	12.7	3.5	3.6	1.5	0.9	16	1.9	11.2	2.9	1.0	14	7.4	1.2	0.54	4.6	32	52	0.02
AAC Synergy	8.3	1.9	3.3	1.5	0.7	4	1.7	11.7	4.0	1.0	22	11.8	1.2	0.54	4.5	38	46	0.03
<b>TR21665</b>	<b>13.9</b>	<b>5.2</b>	<b>4.6</b>	<b>1.2</b>	<b>0.9</b>	<b>11</b>	<b>2.0</b>	<b>8.9</b>	<b>2.4</b>	<b>1.1</b>	<b>23</b>	<b>13.7</b>	<b>1.3</b>	<b>0.70</b>	<b>4.1</b>	<b>48</b>	<b>37</b>	<b>0.04</b>

TKW = 1000 kernel weight, Moist. = moisture, Prot. = protein, Chit. = chitting, Friab. = friability, P&B = peeled & broken seed, DP = diastatic power, AA = alpha- amylase, Fine ext. = fine extract, Sol. Prot – soluble protein, Kol. Index = Kolbach Index, FAN = free amino nitrogen, B-Glu = beta-glucan, Visc. = viscosity

Table 5. Malting quality data for TR21665 from the 2021 and 2022 Western Cooperative Two-Row Barley Registration Trial.

Entry	Barley					Malt					Wort					
	Plumps >7/64 %	Plumps >6/6 4 %	TKW g	Prot. %	RVA (RVU)	Friability %	P&B %	Prot. %	DP °L	AA D.U.	Fine Extract %	Soluble Protein %	Kolbach Index %	B-Glu mg/L	Visc. cP	FAN mg/L
<b>2021 Mean</b>																
CDC Copeland	44.1	94.9	42.9	12.1	86	86.0	-	12.2	151	70.6	79.7	5.23	43.0	191	100	1.44
AAC Synergy	60.5	95.9	45.2	12.1	78	75.3	-	11.9	150	82.3	80.5	5.27	44.8	197	82	1.42
<b>TR21665</b>	<b>41.0</b>	<b>92.4</b>	<b>40.5</b>	<b>11.8</b>	<b>63</b>	<b>82.9</b>	<b>-</b>	<b>11.4</b>	<b>138</b>	<b>84.1</b>	<b>81.5</b>	<b>5.58</b>	<b>48.9</b>	<b>227</b>	<b>65</b>	<b>1.42</b>
CV	17.7	1.6	3.4	4.3	26.3	7.8	-	4.5	7.5	8.5	0.7	5.32	5.3	9.1	26.2	0.94
LSD <sub>0.05</sub>	21.20	2.52	2.43	0.84	43.8	12.36	-	0.88	19.5	10.83	0.93	0.45	3.75	28.5	34.0	0.02
Stn. Years	2	3	3	3	2	2	-	3	3	3	3	3	3	3	3	3
<b>2022 Mean</b>																
CDC Copeland	58.5	94.0	44.4	11.8	124.0	86.8	0.9	11.4	148.2	73.2	81.7	5.11	44.7	201.8	102.6	1.45
AAC Synergy	76.6	97.4	47.3	11.5	99.5	88.2	1.4	11.0	145.0	82.6	83.2	4.96	45.3	196.2	80.2	1.43
<b>TR21665</b>	<b>67.0</b>	<b>95.3</b>	<b>44.7</b>	<b>11.4</b>	<b>75.0</b>	<b>92.1</b>	<b>1.6</b>	<b>11.0</b>	<b>155.4</b>	<b>90.8</b>	<b>83.8</b>	<b>5.49</b>	<b>50.0</b>	<b>254.3</b>	<b>63.8</b>	<b>1.44</b>
CV	11.7	1.8	4.1	4.2	21.0	5.9	39.8	4.8	8.0	7.2	0.9	5.42	6.4	8.8	30.0	1.66
LSD <sub>0.05</sub>	12.83	2.74	3.07	0.81	49.2	8.36	1.34	0.88	20.17	9.16	1.26	0.44	4.56	29.1	44.8	0.04
Stn. Years	3	3	3	3	2	3	2	3	3	3	3	3	3	3	3	3

TKW = 1000 kernel weight, Prot. = protein, RVA = measurement of pre-harvest sprouting, Friab. = friability, P&B = peeled & broken seed, DP = diastatic power, AA = alpha-amylase, B-Glu = beta-glucan, Visc. = viscosity, FAN = free amino nitrogen

Table 6. Supplemental DON data for TR21665 and standard disease checks in the 2020 FHB nursery at AAFC Brandon.

Entry	Disease	Check Type	Average DON (ppm)
CDC Mindon	R	2-row	5.3
AC Metcalfe	I	2-row	8.2
CDC Bold	S	2-row	15.1
Chevron	R	2-row	7.6
Quest	I	6-row	6.3
Stander	S	6-row	21.6
<b>TR21665</b>			<b>5.0</b>

S – susceptible, MS – moderately susceptible, I – intermediate, MR – moderately resistant, R – resistant