

## MEMORANDUM

**TO:** *Prairie Recommending Committee for Pulse and Special Crops*  
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**DATE:** January 31, 2020

**SUBJECT: Request for Support for Registration of Navy Bean 4910CBB-2**

4910CBB-2 was tested in the SSNR Trials in 2018 and 2019. It comes from a complex pedigree of crosses among navy beans (Fig1). The last cross was made in winter 2012.

It is much higher yielding than the check Envoy. The plants are upright, determinate and are a few cm taller than Envoy. White mold scores were slightly better than Envoy. It has intermediate scores for anthracnose tolerance. The post cooking scores and canning results were similar to Envoy.

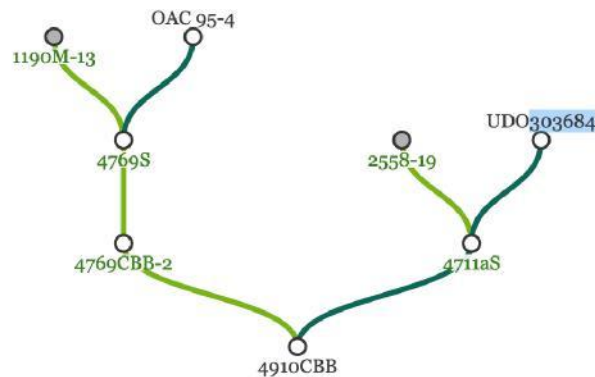


Figure 1. Pedigree of 4910CBB-2



Figure 2: Seed of 4910CBB-2 and the check Envoy

**Strengths**

Much higher yielding than the check Envoy (127%)  
Much better seed coat colour pre- and post- processing.  
Carries the SU91 marker for CBB tolerance

**Neutral Traits**

Canning and cooking scores similar to the check Envoy  
2 days later than Envoy

**Weaknesses**

Intermediate for tolerance to anthracnose races 73 and 105. But, if Breeder sub-lines are segregating, only the tolerant ones will be used.

**Performance Data**

See accompanying Tables for agronomic, cook/canning data, and disease reactions

**Table 1: Two year agronomic performance data for 4910CBB-2 navy bean in the 2018-2019 Short Season Narrow Row Dry Bean Co-operative Trial "A" in western Canada**

Market Line	[51 [6 % of MC				[51 [51 Days to flower			[71 [71 Days to mature			[61 [61 Pod Clearance (%)		
	2018	2019	Mean	MC	2018	2019	Mean	2018	2019	Mean	2018	Mean	
<b>Envoy Navy</b>	<b>1782</b>	<b>1907</b>	<b>1850</b>	<b>100</b>	<b>52</b>	<b>59</b>	<b>56</b>	<b>95</b>	<b>105</b>	<b>100</b>	<b>77</b>	<b>76</b>	<b>76</b>
Portage Navy	1843	2177	2025	109	53	58	56	96	105	101	77	73	75
4910CBB-2 Navy	2253	2421	2345	127	53	58	56	96	107	102	78	76	77

**Bold indicates Market class check variety**  
**[ 1 Indicates number of sites**

Market Line	[31 [21 Plant Height (cm)			[31 [31 Seed Weight (g/1000)			[41 [31 Lodging (1-5)		
	2018	2019	Mean	2018	2019	Mean	2018	2019	Mean
<b>Envoy Navy</b>	<b>39</b>	<b>55</b>	<b>45</b>	<b>173</b>	<b>181</b>	<b>177</b>	<b>2.0</b>	<b>2.1</b>	<b>2.1</b>
Portage Navy	40	57	47	171	178	174	1.4	1.3	1.4
4910CBB-2 Navy	39	60	47	170	178	174	1.8	1.7	1.7

**Bold indicates Market class check variety**  
**[ 1 Indicates number of sites**

**Table 2. Cooking Quality Evaluation of 4910CBB-2 in the 2019 Short Season Narrow Row Dry Bean**

Name	Cooking quality			
	16 h, 21°C		20 min at 93°C	
	Hard seed (%)	Partially hydrated seed (%)	Hard seed (%)	Partially hydrated seed (%)
<b>Navy</b>				
Envoy	17.7	0.3	2.2	0.5
Portage	2.0	0.0	0.0	0.0
4910CBB-2	14.2	0.5	1.7	0.7
LSD	5.9	0.5	2.4	0.6
CV	38.4	144.3	159.5	146.4

**Cooking Quality Traits:**

Hard seed (%): Two hundred seeds were soaked in de-ionized water at room temperature (21°C) for 16h (overnight) and cooked for 20min at 95°C. Percentage hard seed was determined before and after cooking. Percentage partially hydrated seed was determined before and after cooking.

**Table 3. Canning Quality Evaluation of 4910CBB-2 Dry Bean Line in the 2019 Short Season Narrow Row Dry Bean Cooperative Trial in western Canada**

Name	100-seed wt. (g)	Canning quality												
		Hydration coefficient (HC)			Drained wt. (%)	Matting (1 to 4)	Appearance (1 to 4)	Dry color			Canned color			Texture (kg force)
		HC (16 h, 21°C)	HC (3 min, 93°C)	HC (3 min, 93°C)				L*	a*	b*	L*	a*	b*	
<b>Navy</b>														
Envoy	16.6	1.9	2.1	59.9	3.7	4.0	63.84	2.77	9.97	49.61	20.48	31.23	27.2	
Portage	17.1	2.1	2.3	61.3	4.0	4.0	61.46	2.51	11.04	50.28	20.07	30.87	24.5	
4910CBB-2	17.0	1.9	2.1	63.2	2.3	3.0	61.89	2.86	10.80	49.66	19.59	30.63	34.7	
LSD	1.6	0.0	0.1	2.4	1.2	1.3	4.01	0.29	0.68	1.54	1.10	1.58	5.8	
CV	5.3	1.2	2.5	2.1	25.0	24.3	3.53	5.82	3.47	1.70	3.10	2.85	10.2	

Note: 1). Means are from three locations and three replications per location.

**Canning Quality Traits**

Hydration Coefficient after soaking (HC): A predetermined amount of seed based on the bean market class was soaked for 16h in deionised water at room temperature (21°C). HC after soaking was determined as: seed weight after soaking/weight of dry seed

Hydration coefficient after blanching (HC): Soaking seed was blanched for 3 min at 93°C. HC after blanching was determined as: seed weight after blanching / weight of dry weight.

Drained weight (%): All bean seeds except navy bean were processed at 121°C for 20 min at 4 rpm in brine and navy bean seeds were processed at 121°C for 40min at 4rpm in tomato sauce in a 2402 Multimode R&D Retort (Allpax Products, LLC, Covington, LA). Can content was weighed and the weight of bean seed was determined after washing in tap water on a 8 mesh screen (Tyler series) positioned at a 15° angle. Percentage drain weight was determined as: (weight of bean seed / weight of can content) \* 100

Matting: Matting (clumping) of seeds was assessed on a 1 to 4 scale, where 1 = none, 2 = trace, 3 = slight, and 4 = moderate.

Appearance: Appearance of seeds was assessed on a 1 to 4 scale, where 1 = excellent, 2 = good, 3 = acceptable, and 4 = poor.

Seed Colour: Colour of dry bean seed: L\*, a\*, and b\* attributes of colour were measured on dry and processed (canned) seed using a CR-410 Chromameter (Konica Minolta Sensing Americas, Inc., Ramsey, NJ, USA).

L\* indicates "lightness-darkness" with higher values indicate whiteness; a\* indicates "red-green" with positive values indicate redness and negative values indicate greenness; and b\* indicates "yellow-blue" with positive values indicate yellowness and negative values indicate blueness. One-hundred g of processed bean seed was used to determine colour after canning.

Texture: Texture (Firmness) (kg-force) was determined by placing 100g of washed drained bean in to a standard shear compression cell (CS-1) of Texture Measurement System Touch (TMS-Touch, Food Technology Corp., Sterling, VA) and shearing them using a load cell of 255 kg-force at a rate of 0.83 cm sec-1. Work (J) refers to the area under the Firmness curve. Slope to peak (N/mm) refers to the slope of the Firmness curve.

**Table 2. Anthracnose data for 4910CBB-2 Dry Bean in the 2019 Short Season Narrow Row Dry Bean Co-operative Trial "A" in western Canada**

		2018 SSNR						2019 SSNR									
		Race 73			Race 105			Race 73			Race 105						
Cultivar	Class	Test #1		Test #2		Test #1		Test #2		Test #1		Test #2					
		Est.	Rank	Est.	Rank	Est.	Rank	Est.	Rank	Est.	Rank	Est.	Rank				
Envoy	NA	0.5	ac	0.0	ac	7.9		8.6	c	0.0	ac	0.0	ac	9.0	c	8.3	c
Portage	PT	8.6	bcd	9.0	bcd			9.0	c	9.0	bcd	9.0	bd	8.8	c	8.8	c
4910CBB-2	NA	5.6	abd	2.3	abc	0.0	abcd	1.1	abd	1.3	ac	0.5	ac	1.6	abcd	0.0	abd
AC Pintoba	PT	9.0	bcd	9.0	bcd	8.5	c	8.9	c	9.0	bcd	7.3	bd	8.7	c	8.3	c
Othello	PT	3.7	abd	5.5	abd	3.3	abcd	3.6	abd	6.0	abd	6.3	bd	4.8	abd	2.3	abd
Dresden	NA	0.0	ac	0.0	ac	8.8	c	8.6	c	0.0	ac	0.0	ac	9.0	c	9.0	c
Num DF		1	8	4	1	18		18		1	8	4	1	18		18	
Den DF			2	8		41		39			4	5		41		40	
F Value		<	.0	0	0	62.49		36.47		17.45		<	.0	0	0	20.07	
Pr>F				1		<.0001		<.0001		<.0001		1		<.0001		<.0001	
LSD(0.05)		2.2				1.5		1.6		2.2				1.7		2.3	
<b>Dunnetts Test</b>																	
a = significantly different than AC Pintoba						c = significantly different than Othello											
b = significantly different than Envoy						d = significantly different than Dresden											
PT = pinto; BK = black; NA = navy; R = Red																	

**Table 3. White Mold data for 4910CBB-2 Dry Bean in the 2019 Short Season Narrow Row Dry Bean Co-operative Trial "A" in western Canada**

White Mold Data					
		2018		2019	
Name	Type	Incidence (%)	Index (1-4)	Incidence (%)	Index (1-4)
Envoy	Navy	98.3	3.8	4.0	1.1
Portage	Navy	54.1	2.2	1.4	1.0
4910CBB-2	Navy	42	1.8	3	1.1
<b>C</b>		15.6	10.63	239.9	4.2
<b>V</b>		12.29	0.3	2.6	0.0
Severity index (1-4): 1 = healthy, 4 = dead					

Available breeder seed for distribution: approx. 25kg.