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REGISTRATION

Cultivar

Registration of 'SB255' winter barley

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Abstract

'SB255' (Reg. no. CV-373, PI 693987) is a six-rowed hulled barley (*Hordeum vulgare* L.) cultivar with winter growth habit. The cultivar was released by the Virginia Agricultural Experiment Station in May 2019. SB255 is widely adapted, high yielding, high grain volume weight, and medium tall. It has good winterhardiness and good straw strength. The spikes of SB255 are strap and slightly waxy with no overlapping lateral kernels and with long awns. Prior to being named, SB255 was tested under the experimental designation VA11B-141 (LA). It was derived from the cross Spont03-44/VA01B-44 and developed using a modified-bulk breeding method. It was evaluated from 2013 to 2019 in the Virginia Official Variety Trials at five to six locations. SB255's average grain yield (5,214 kg ha^{-1}) was similar to the check cultivars 'Secretariat' and 'Thoroughbred' but significantly ($P \leq .05$) higher than 'Atlantic', 'Price', 'Callao', 'Nomini', and 'Wysor'. Average grain volume weight of SB255 (60.8 kg hL^{-1}) was similar to Secretariat and Price but exceeded ($P \leq 0.05$) those of Thoroughbred, Atlantic, Callao, Nomini, and Wysor. Head emergence of SB255 was similar to Thoroughbred and 2–5 d later than winter feed barley cultivars Secretariat, Atlantic, Price, Callao, and Nomini. SB255 was developed primarily as a feed barley cultivar. It provides barley producers and end users in the eastern United States with a high-grain-yielding cultivar having good to moderate resistance to all diseases prevalent in the eastern United States, including Fusarium head blight (FHB), and also lower deoxynivalenol (DON) accumulation in the grain.

Abbreviations: DON, deoxynivalenol; FHB, Fusarium head blight; BYDV, *Barley yellow dwarf virus*; IT, infection type; UWBYN, Uniform Winter Barley Yield Nursery; UBWHN, Uniform Barley Winter Hardiness Nursery.

1 | INTRODUCTION

'SB255' (Reg. no. CV-373, PI 693987) is a six-rowed hulled feed barley (*Hordeum vulgare* L.) cultivar with winter growth habit. The cultivar was released by the Virginia Agricultural Experiment Station in March 2019. SB255 greatest strengths are high yields, high grain volume weight, and broad-spectrum disease resistance to leaf rust (caused by *Puccinia hordei* G. Otth), powdery mildew [caused by *Blumeria graminis* (DC.) E.O. Speer f. sp. *hordei* Em. Marchal], and net blotch (caused by *Pyrenophora teres* f. *teres* Smedeg.) and moderate resistance to Fusarium head blight (FHB; caused by *Fusarium graminearum* Schwabe), and lower deoxynivalenol (DON) accumulation in the grain. The warm, humid climate of the southeastern United States often favors higher levels of diseases than other parts of the country, especially diseases of the leaves and head. SB255 is well adapted to the barley production areas of the mid-Atlantic and southeastern U. S. regions. Winter barley is a major rotation crop in the mid-Atlantic and southeastern United States (Lewis and Phillips, 1976). Planting soybean [*Glycine max* (L.) Merr.] following winter barley is an integral component of double cropping systems in the eastern United States due to barley's earlier maturity in comparison to wheat, *Triticum aestivum* L. (Browning, 2011; Camper et al. 1972). Inclusion of both wheat and barley in a cropping system allows producers to extend the time available for planting and harvesting these crops and reduces the buildup of crop-specific pathogens. Winter barley also has the potential to increase overall production without expanding land area, potentially increasing net return for farmers and aiding in a sustainably intensified farming system (Kyei-Boahen & Zhang, 2006).

SB255 was evaluated in the Virginia Official Variety Trial over 6 yr (2013–2019), and the regional USDA-ARS Uniform Winter Barley Yield Nursery (UWBYN) and Uniform Barley Winter Hardiness Nursery (UBWHN) for 3 to 4 yr (2015–2018). SB255 winter barley will provide producers in the eastern United States with a high-yielding, high grain volume weight cultivar having moderate resistant to FHB, leaf rust, and powdery mildew. It has expressed higher levels of resistance to leaf rust than the cultivars 'Atlantic' (PI 665041; Brooks et al., 2014), 'Price' (PI 632708; Brooks et al., 2005a), and 'Callao' (PI 592800; Price et al., 1996) and is more resistant than 'Thoroughbred' (PI 634933; Brooks et al., 2005b) to powdery mildew and leaf rust. In addition, FHB values for SB255 are similar to the moderately resistant six-rowed cultivars 'Nomini' and 'Secretariat' (PI 673931; Brooks et al., 2016) and lower than the check cultivars Atlantic, Thoroughbred, Callao, and Price. SB255 also has expressed low DON accumulation, similar to Nomini and lower than Secretariat, Atlantic, Thoroughbred, Callao, and Price. The principle end use of SB255 grain is as feed, but its good kernel quality and grain compositional traits (data not shown) may also allow it to be used in other applications such as for food and other industrial (biofuel and grain by-products) end uses. Used as an alternative feed ingredient, barley may reduce costs and increase profitability for growers and end users in the eastern United States in comparison to corn, *Zea mays* L. (Alquaisi et al., 2019, Pork Checkoff Board, 2008).

SB255 provides barley producers in North Carolina, Maryland, Pennsylvania, Kentucky, and Virginia with a high-yielding cultivar with good grain quality and desirable levels of resistance to the prevalent diseases including FHB and low DON accumulation.

2 | METHODS

2.1 | Parentage, breeding history, and line selection

SB255 winter barley was derived from the cross Spont03-44/VA01B-44.

Parentage of Spont03-44 is 'Barsoy' (PI 583865)*3 //R9 (*Hordeum spontaneum* K. Koch)/2*Barsoy. *Hordeum spontaneum* is a wild progenitor of cultivated barley. Accession R9 was obtained from Israel (provided by Professor Aviatar Nevo, Director International Graduate Center of Evolution, University of Haifa, Haifa, Israel) and used as a parent for resistance to leaf rust. The ancestry of VA01B-44 is VA90-42-22/3/CMB81-295//VA89-42-9 (CI4979)/'Monroe' (CI 15691)/VA90-42-64/4/VA92-42-46/5/VA94-42-13. The parental line VA90-42-22 was derived from the cross VA79-45-101/Monroe//'Sussex' (PI 471914). Line VA79-45-101 was derived from an F_2 population composed of two composite crosses, which consisted of (a) CI 7386/'Surry' (CI 15689)//CI 9623, 9658, 9708, *Barley yellow dwarf virus*–resistant 'Atlas'/'Hanover' (CI 13197) or 'Rapidan'; (b) CI 7386/Surry//Barsoy/Hanover. Parentage of VA92-42-46 is [(CIs 9623 9658, 9708, *Barley yellow dwarf virus*–resistant Atlas/Hanover or Rapidan)//('Harrison'/3/'Cebada Capa'/'Wong'//Awnleted 'Hudson' Selection)/4/(Harrison/3/Cebada Capa/Wong//Awnleted Hudson Selection)/3/'Jotun' (PI 539136)/5*Hudson (CI 8067)//Rapidan/VA66-42-45]. The ancestry of VA66-42-45 is Cebada Capa/Wong//Awnleted Hudson Selection.

The cross from which SB255 was derived was made in spring 2005, and the F_1 was grown in the field as a single 1.2-m headrow in 2006 to produce F_2 seed. The population was advanced from the F_2 to F_4 generation using a modified-bulk breeding method. Barley spikes were selected from the population in each segregating generation (F_2–F_3) on the basis of absence of disease, early maturity, short straw, and desirable head type and size. Selected spikes were threshed in bulk, and the seed was planted in 20.9-m^2 blocks at Blacksburg and/or Warsaw, VA, during the fall of each year. Spikes

selected from the F_4 bulk were threshed individually using a Wintersteiger Hege 16 laboratory thresher (Wintersteiger AG) and planted in separate 1.2-m headrows at Warsaw. SB255 was selected on the basis of maturity, disease resistance, lodging tolerance, and agronomic type as a bulk of one of these $F_{4:5}$ headrows in 2010. It was tested as entry 141 in nonreplicated observation yield tests at Blacksburg and Warsaw in 2011.

2.2 | Line evaluation in replicated yield trials

SB255, tested as VA11B-141 (LA), was evaluated in the Virginia Official Variety Trials at five to six locations (Blacksburg, Orange, Blackstone, Warsaw, Holland, and Painter, VA) from 2013 to 2019; complete data for these nurseries are available at the Virginia Tech Small Grains Archive (Virginia Tech Cooperative Extension, 2013–2019). It was also evaluated in the regional USDA-ARS UWBYN and the UBWHN conducted across four to seven environments in each of 3 to 4 yr (2015–2018). Complete data for these nurseries (2015–2018, UWBYN) and (2015, 2016, and 2018, UBWHN) are available at USDA-ARS (2015–2018). Data from the 2015–2018 UWBYN and the 2015, 2016 and 2018 UBWHN are summarized herein (Table 1). The UWBYN trials were conducted at one to two locations per state (Georgia, North Carolina, Nebraska, Texas, and Virginia). These trials were conducted using randomized complete block designs with two to four replications. Each cooperator used standard variety testing protocols and management practices recommended for their respective state. Plant traits assessed visually (e.g., straw strength and disease reaction) were rated using an ordinal scale from 0 (no visible symptoms) to 9 (severe symptoms).

All replicated yield tests in Virginia were conducted according to protocols for small-grain production and management as recommended by Brann et al. (2000). Conventional-till yield plots in the Virginia Official Variety Trial were composed of seven rows with 17.8 cm between rows at Blackstone, Holland, Orange, and Painter, VA, and seven rows with 15.2 cm between rows at Warsaw and Blacksburg. The harvested plot length was 2.74 m at all locations. Tests were planted at 28 seeds per 0.304 m of row.

2.3 | Statistical analyses

Statistical analyses were preformed either in SAS version 9.3 (SAS Institute, 2011) or Agrobase Generation II (ver. 16.2.1, Agronomix Software, 2004). Analysis of variance of agronomic performance data from the Virginia Official Variety Trial was conducted on data from individual locations and years and across locations and years, which is routinely performed in official variety trials, using PROC GLIMMIX available in SAS. Genotypes, locations, and years were treated as fixed effects, and replication was treated as a random effect. Mean comparisons among traits were tested using Tukey's honestly significant difference test ($P = .05$) to identify significant differences among genotypes. Analysis of variance for the UWBYN data was conducted by year with Agrobase Generation II, with genotypes and locations treated as fixed effects. Mean comparisons of traits using a protected LSD ($P = .05$) test were made to identify significant differences among genotypes.

2.4 | Disease ratings

In field experiments, disease severity was rated using an ordinal scale varying from 0 (no visible symptoms) to 9 (severe symptoms), which is used predominantly in breeding programs (Poland & Nelson, 2011). Assessment of reaction to FHB was conducted in replicated, inoculated, and mist-irrigated nurseries according to the procedures described by Chen et al. (2006). Ten spikes per plot were evaluated for FHB incidence (number of infected spike/total number of spikes)×100 and FHB severity (number of infected spikelets/total number of spikelets)×100. Reaction of seedlings to races 8 and 30 and two isolates (ND89-3 and 3757) of leaf rust and a field composite of powdery mildew was assessed in greenhouse experiments (Berger et al. 2012). Ten to 14 d after inoculation, primary and secondary leaves were rated using the 0–4 scale as described by Levine and Cherewick (1952), where infection types (IT) 0–2 denote resistance and IT 3–4 denote susceptibility.

2.5 | Seed purification and increase

During fall 2015, 400 $F_{9:10}$ headrows of SB255 were planted in an isolation block and evaluated for purity and trueness of type. Among these breeder seed headrows, 51 rows were discarded on the basis of poor vigor, disease susceptibility, and variability as well as lack of trueness to cultivar type. The 349 remaining rows that were similar in phenotype and visually homogenous were harvested in bulk, and this initial breeder seed (10 kg) was planted on a 0.62-ha increase strip sown at the Virginia Crop Improvement Association's Foundation Seed Farm at Mount Holly, VA, during fall 2016. This increase strip produced about 283 kg of initial seed of SB255 for use in subsequent years to generate additional seed. The seed produced from these initial and subsequent increases is being grown under contract. Seed of SB255 planted in 2018 for further multiplication was made available to Seedway LLC, who will be responsible for subsequent seed production, marketing, and distribution.

TABLE 1 Agronomic performance of SB255 and barley check cultivars evaluated in the Uniform Winter Barley Yield Nursery (UWBYN), 2015–2018 (USDA-ARS)

Cultivar	Grain yield	Volume weight	Days to heading	Plant height	Straw strength	Leaf rust	Powdery mildew	Net blotch	Winter survival	Winter survival (UBWHN)
	kg ha^{-1}	kg hL^{-1}	d	cm	0-9[a]				%	
2015										
SB255	6,310	62.9	107	89	3.8	2.3	0.0	1.0	72	42
Secretariat	6,472	61.3	105	76	4.7	1.0	0.0	0.7	71	42
Atlantic	5,719	58.2	104	72	5.2	7.3	0.0	1.5	67	–[b]
Thoroughbred	6,122	59.7	110	85	4.4	8.7	7.0	1.2	63	–
Wysor	5,112	56.1	106	91	5.5	9.0	0.0	2.0	64	–
Tambar 501	5,391	54.6	107	88	6.6	4.3	5.0	2.3	84	–
Grand mean (all lines)	5,445	60.7	108	83	5.1	5.0	1.7	1.3	73	52
CV (%)	11.7	5.5	1	6	33.0	15.3	44.7	87.1	20.4	10
LSD (.05)	758	3.1	1	2	2	1.1.1	1.0	1.1	20.6	11
Number of locations	4	4	4	4	4	1	1	2	3	10
2016										
SB255	5,010	62.4	105	89	1.6	1.3	0.0	2.8	–	91
Secretariat	5,289	62.7	102	79	2.1	1.0	0.2	3.6	–	85
Atlantic	5,090	61.4	100	77	2.0	5.3	0.0	3.8	–	–
Thoroughbred	5,122	61.4	107	81	2.3	5.0	5.8	5.0	–	–
Wysor	5,053	56.0	105	92	1.8	6.3	0.0	3.9	–	–
Tambar 501	4,816	54.8	104	90	2.7	2.3	2.8	6.0	–	–
Grand mean (all lines)	4,834	62.2	105	87	2.2	4.2	1.9	3.7	–	88
CV (%)	9.5	4.8	2	11	45.8	16.4	39.3	44.5	–	8
LSD (.05)	489	2.5	2	5	1.2	1.0	1.2	2.6	–	15
Number of locations	5	5	5	4	4	1	2	4	–	9
2017										
SB255	4,655	56.8	104	86	3.7	2.8	0.5	2.6	–	–
Secretariat	4,510	55.0	102	71	5.5	0.5	0.2	2.7	–	–
Atlantic	4,268	52.1	100	72	5.7	4.2	0.0	3.5	–	–
Thoroughbred	4,520	54.2	105	79	3.3	5.7	4.5	5.2	–	–
Wysor	3,419	50.6	102	89	5.9	6.0	0.0	3.7	–	–
Tambar 501	4,300	44.5	102	85	5.3	2.3	1.7	4.6	–	–
Grand mean (all lines)	4,359	56.5	103	80	4.8	3.6	0.9	2.9	–	–
CV (%)	17	7.5	1	12	26.9	23.4	132.1	35.0	–	–
LSD (.05)	769	2.1	1	4	1.2	1.4	1.6	1.2	–	–
Number of locations	5	5	2	5	6	2	2	4	–	–
2018										
SB255	4,359	55.0	114	94	8.1	3.0	–	5.7	–	70
Secretariat	4,537	55.6	114	92	7.3	1.0	–	3.7	–	–
Atlantic	4,741	53.5	113	88	7.4	4.3	–	6.9	–	–
Thoroughbred	3,752	49.4	120	93	6.5	4.0	–	9.0	–	–
Wysor	3,746	49.8	115	101	6.8	6.0	–	6.9	–	–
Tambar 501	4,418	46.8	115	102	6.1	3.3	–	8.3	–	–
Grand mean (all lines)	3,995	52.9	117	96	7.2	3.3	–	5.7	–	66

(Continues)

TABLE 1 (Continued)

Cultivar	Grain yield	Volume weight	Days to heading	Plant height	Straw strength	Leaf rust	Powdery mildew	Net blotch	Winter survival	Winter survival (UBWHN)
CV (%)	19	3.8	1	9	15.5	29.5				10
LSD (.05)	914	1.9	2	5	1.3	1.6				14
Number of locations	4	4	3	3	4	1		2		9

Note.Complete data available at USDA-ARS (2015–2018).

[a]Straw strength and reaction to plant diseases: 0 = highly resistant, 9 = highly susceptible.

[b]–, cultivar not tested.

3 | CHARACTERISTICS

3.1 | Botanical and agronomic characteristics

SB255 is six-rowed with full-length, rough awns and erect juvenile growth. The erect flag leaves are slightly waxy and upright at the booting stage. The leaf sheaths and stems are slightly waxy, without anthocyanin in the leaves or stems. The stems have four nodes, closed collars, "slightly curved" peduncles, and an exertion of 0–3 cm above the base of the flag leaf blade. The six-rowed spikes of SB255 are erect, strap, and slightly waxy with no overlapping lateral kernels. The rachis is covered with short hairs. Glumes are more than half of the lemma, with short hairs, and their awns are semismooth and less than equal to the length of the glumes. The lemma awn surfaces are rough, and awns are longer than the spike length. The basal marking of the lemma is a slight crease. Rachilla hairs are short. Kernels are covered and short with a colorless (primarily white) aleurone with hairs present on the ventral furrow. SB255 has winter growth habit; it requires vernalization and has sufficient low temperature tolerance for production in the mid-Atlantic and southeastern United States.

3.2 | Field performance

SB255 was compared with several established Virginia six-rowed feed (hulled) cultivars (Secretariat, Atlantic, and Thoroughbred) grown in the mid-Atlantic and southeastern United States. It was evaluated in the 2013–2019 Virginia Official Variety Trials and the UWBYN (USDA-ARS, 2015–2018).

In the Virginia Official Variety Trial, the 7-yr (2013–2019) average grain yield of SB255 (5,214 kg ha^{-1}) was similar to that of Secretariat and Thoroughbred but significantly ($P \leq .05$) higher than those of the other barley cultivars (Atlantic, Price, Callao, and Nomini) grown in the mid-Atlantic and southeastern United States (Table 2). The average grain volume weight of SB255 (60.8 kg hL^{-1}) was similar to that of Secretariat and higher than those of the check cultivars Nomini and 'Wysor' (PI 501526; Starling et al., 1987). Average straw strength of SB255 was better than that of Secretariat, Atlantic, and Callao. Average spike emergence (d from 1 January) of SB255 (114 d) was similar to that of Thoroughbred and 3 d later than Secretariat and Price. In the UWBYN (Table 1), mean grain yields of SB255 varied from 4,359 to 6,310 kg ha^{-1} and were similar to those of Atlantic and Thoroughbred in all years (2015–2018) and higher than Wysor and 'Tambar 501' (PI 620639; Marshall et al., 2003) in 2 (2015, 2017) of 4 yr. Average grain volume weight of SB255 varied from 55.0 to 62.9 kg hL^{-1}, which was similar to those of Secretariat in all 4 yr, to those of Atlantic in 2 (2016, 2018) of 4 yr, but higher than those of Wysor in all years. Grain volume weight of SB255 in these tests was similar to Secretariat and notably higher than those of the check cultivars. Straw strength rating varied in the UWBYN (Table 1) from 1.6 to 8.1, being better or similar to the checks in 3 of 4 yr. Pike emergence of SB255 in the UWBYN ranged from 104 to 114 d (Table 1) depending on year. Average plant height of SB255 (89 cm) in Virginia is 4 and 5 cm shorter than Wysor and Nomini, respectively, and 6 cm taller than Thoroughbred, and plant height of SB255 in the UWBYN varied from 86 to 94 cm. In addition, winter survival for SB255 (Table 1) in 2015 was 72%, similar to the check cultivars.

On the basis of data (Table 1) from 13 environments in the 2015, 2016, and 2018 UBWHN (USDA-ARS, 2015–2018), the mean winterhardiness (0–100% survival) of SB255 ranged from 42 to 91% depending on year compared with means from 42 to 85% for the cultivar Secretariat. The 3-yr (2015, 2016, 2018) average winter survival (data not shown) of SB255 was 67.7% versus 67.3% for 'Tennessee Winter' (PI 11193, CI 257), 65.3% for 'Kentucky 1', and 39.0% for the winter-tender check cultivar 'Trebi' (PI 537442, CI 936; Wiebe, 1965). Complete data for UBWHN are available at USDA-ARS (2015–2018).

TABLE 2 Agronomic performance and disease reaction of SB255 versus seven barley check cultivars in the Virginia Official Variety Trial, 2013–2019

Cultivars	Grain yield	Volume weight	Days to heading	Plant height	Straw strength	Leaf rust	Powdery mildew	Net blotch
	kg ha^{-1}	kg hL^{-1}	d	cm	0–9[a]	0–9[b]		
SB255	5,214	60.8	114	90	3.2	2.3	0.3	1.9
Secretariat	5,348	60.3	111	79	4.3	0.9	0.3	2.6
Thoroughbred	5,192	58.4	115	84	3.1	6.2	4.8	4.4
Atlantic	5,001	58.8	109	77	4.5	4.3	0.4	3.6
Price	4,814	59.1	111	79	3.6	4.6	0.7	5.3
Callao	4,530	58.5	109	72	6.1	4.1	0.3	2.9
Nomini	4,141	55.5	110	95	2.9	4.7	0.4	1.6
Wysor	3,887	54.4	111	94	4.0	6.7	0.2	4.0
Average (n = 7)	4,702	57.9	111	83	4.1	4.5	1.0	3.5
LSD (.05)	154	0.5	0.0	1.8	0.3	0.4	0.3	0.4
CV (%)	12.9	4.6	1	18	34	23	79	4
Location-years	36	35	14	19	36	11	10	17

[a]0 = no lodging; 9 = completely lodged.
[b]0 = highly resistant; 9 = highly susceptible.

TABLE 3 Reaction of SB255 and check cultivars to Fusarium head blight (FHB) in the Virginia Official Variety Trial, 2013–2019

Cultivars	FHB incidence[a]	FHB severity[b]	FHB index[c]	DON[d]	ISK[e]
	%		0–100	mg kg^{-1}	0–100
SB255	71.6	19.6	16.9	9.8	23.9
Nomini	68.9	24.7	20.9	8.0	28.0
Secretariat	76.4	25.3	21.8	17.9	27.6
Atlantic	84.4	30.9	28.0	17.9	33.2
Thoroughbred	82.2	27.9	23.6	17.5	31.0
Price	82.3	35.0	30.6	18.1	33.8
Callao	85.0	30.1	27.6	22.5	34.2
Wysor	85.3	30.7	27.9	13.5	36.1
Mean(n = 11)	78.9	27.3	23.7	15.0	30.8
LSD (.05)	7.5	6.4	6.3	3.6	3.3
CV (%)	13.5	33.1	37.5	36.4	13.4

Note. All traits were analyzed over 6-yr except for ISK index (2017–2019).
[a]FHB incidence = (number of infected spikes/total number of spikes) × 100.
[b]FHB severity (%) = Based on infected spikelet within 10 spikes showing disease symptoms.
[c]FHB index = (% incidence × % severity)/100.
[d]DON = deoxynivalenol content in 100-g lots of harvested seed samples.
[e]ISK index (0–100) = (0.3×incidence) + (0.3×severity) + (0.4×FDK/100); FDK = percentage of Fusarium-damaged kernels.

3.3 | Disease evaluation

SB255 is resistant to leaf rust, powdery mildew, and net blotch. On average, SB255 had leaf rust ratings that varied from 0.7 to 1.0 compared with average scores of 4.0–9.0 for the susceptible cultivar Wysor, which has gene *Rph*7. SB255 is resistant (0–2.5) to powdery mildew compared with Thoroughbred (5.3–7.0) and resistant to net blotch (0.7–3.4) compared with cultivar Tambar 501 (2.3–6.6) based on data from the UWBYN (Table 1).

In inoculated and mist-irrigated FHB field tests, composed of replicated yield plots (Table 3), SB255 exhibited significantly lower incidence/severity/kernel damage (ISK) values in comparison to other commercially available varieties, lower DON concentrations than Secretariat, Atlantic and Thoroughbred, and FHB Index values similar to Nomini and Secretariat.

SB255 expressed moderate resistance to FHB with mean values for incidence of 71.6%, severity of 19.6%, FHB index and ISK index, (0.3×incidence) + (0.3×severity) + (0.4×FDK)/100, values (0–100) of 16.9 and 23.9, respectively (where FDK = percentage of Fusarium-damaged kernels), and a mean DON concentration of 9.8 mg kg^{-1}.

In seedling leaf rust tests (data not presented), SB255 was highly resistant to *P. hordei* isolate 3757 (IT = 0TrN), race 8 (IT = 0) and race 30 (IT = 0) but moderately susceptible (IT = 3C) to isolate ND89-3 compared with average scores of 4 for the universal susceptible check cultivar 'Barsoy' (Griffey & Das, 1994). The virulence/avirulence formulae for these *P. hordei* pathotypes include: isolate 3757 (genes *Rph*1.a, 2, 3.c, 4, 2+6, 7, 8, 9i, 10, 11/*Rph*5, 9.z, 14.ab and 15.ad); race 8 (*Rph* 1.a, 4.d, 8.h, 10.o, 11.p / *Rph* 2, 3.c, 5.e, 6.f, 7, 9.i, 9.z, 13.x, 14.ab, 15.ad); race 30 (*Rph* 1.a, 2, 4.d, 6.f, 7, 8.h, 11.p / *Rph* 3.c, 5, 9.i, 9.z, 10.o, 13.x, 14.ab, 15.ad); and isolate ND89-3 (*Rph* 1.a, 2, 4.d, 5.e, 6.f, 7.g, 8.h, 10.o, 11.p / *Rph* 3.c). Seedlings of SB255 also were resistant (IT = 0–1) to a field composite of *B. graminis* compared with those of Thoroughbred (IT = 3–4). Based on the reaction of SB255 to *P. hordei* isolate ND89-3, with virulence to all known *Rph* genes (tested) except *Rph*3, it is probable that a major resistance gene(s) in SB255 likely is combined with an unknown recessive gene for *P. hordei* resistance.

4 | AVAILABILITY

Virginia Crop Improvement Association provided the initial foundation seed of SB255 to Seedway LLC, P.O. Box 250, Hall NY 14463, one of the remaining full-line seed companies in the country, who will be responsible for subsequent seed production, marketing and distribution. Small amounts of seed may be obtained from the corresponding author for research purposes. SB255 has been deposited in the USDA-ARS National Plant Germplasm System and will be available for distribution after five years from the date of this publication.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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