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Registration of edamame food grade soybean Germplasm, HS-171

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Abstract:

HS-171 is a large-seeded edamame food grade soybean genotype (*Glycine max*. L.) with yellow hilum, low oil, high protein and sucrose concentrations. It is adapted to the areas of southwest Ontario with 3100 or more crop heat units and has a relative maturity rating of 2.6.

Key words: Soybean, *Glycine max* L. Edamame

The edamame food grade soybean line, HS-171 (Reg No: CN119096), was developed by Agriculture and Agri-Food Canada (AAFC), Harrow Research and Development Centre (Harrow-RDC) at Harrow, Ontario for use at the fresh green stage as edamame and released in 2017. It has a large seed, yellow hilum, low oil, high protein and sucrose concentrations that are the typical quality characters of edamame soybean (Castoldi et al. 2011). HS-171 is adapted to areas of southwest Ontario with 3100 or more crop heat units and has a relative maturity of 2.6.

HS-171 has a pedigree of Gardensoy12/3/RCAT Bobcat/RCAT Tabby//Harovinton. Gardensoy12 is a large-seeded edamame type soybean developed by Dr. Richard Bernard, University of Illinois; RCAT Bobcat and RCAT Tabby are high yielding cultivars developed by the soybean breeding program at the University of Guelph, Ridgetown campus; Harovinton is a large-seeded food grade soybean cultivar developed by Harrow-RDC (Buzzell et al. 1991).

F₁ plants were grown in the field at Harrow in 2004, The F₂, F₃, F₄, and F₅ plants were grown in the segregation nursery fields at Harrow in 2005, 2006, 2007, and 2008, respectively with individual plants selected for maturity, lodging resistance, yield potential, disease resistance, and apparent seed size. The selected plants were threshed individually and additional selections were made among the seed samples for size, shape, and colour; seed coat integrity;

and uniformity of seed size and shape. The F_6 seeds were also selected for protein concentration using a FOSS 6500 near infrared spectroscopy (NIR) (Yu et al. 2016). This F_6 seeds were grown in a progeny row yield trial using a modified augmented type-2 design (Lin and Voldeng, 1989) at Harrow in 2009, and the line SG04-0154-EM1E-3 was selected for yield, maturity, lodging resistance, plant height, and seed size, percent protein, oil, and soluble sugar. SG04-0154-EM1E-3 was evaluated for agronomic performance and seed quality in 2-row, 2-replication preliminary F_7 yield trials (PEED10) at two locations (Harrow and Woodslee, ON) in 2010; in 5-row, 2-replication F_8 advanced yield trials (AMIS11) at three locations (Harrow, Woodslee, and Malden, ON) in 2011; and in 5-row, 3-replication F_9 breeder yield trials (BYM12) at six locations (Harrow, Chatham, Ridgetown, Blenheim, Woodslee, and Holiday Beach, ON) in 2012. Selection criteria during yield testing were high yield, acceptable maturity, lodging resistance, seed protein concentration, seed size, seed color and appearance, high water uptake during soaking, and tofu quality and yield. Forty seven individual plants were selected from the BYM12 trials and planted in 2013 as plant breeder rows (PBR). A sample of the bulked F_{10} PBR seeds was deposited with the Plant Gene Resources of Canada in February 2017 and assigned the Reg No. CN119096.

In the BYM12 trial, with OAC Thamesville as the check cultivar, HS-171 yielded 3.62 t ha^{-1} , which was about 4% less than the check (Table 1). HS-171 had 29.9g 100 seeds $^{-1}$, which was 8.1g 100 seeds $^{-1}$ heavier than the check. The seed protein concentration of HS-171 on a dry weight basis measured with the NIR was 44.9%, which was 2.5% higher than the check. HS-171 had a slightly higher sucrose concentration than the check. HS-171 matured in 135 days, 6 days later than the check, and had a plant height of 97cm with a lodging score of 2.1 (with 1.0 being erect and 5.0 lodged flat). HS-171 has an indeterminate growth habit, purple flowers, and grey

pubescence. The seeds are dull yellow with yellow hilum. In the tests conducted at Harrow, HS-171 also had satisfactory soymilk and tofu processing qualities (data not shown).

Requests for sample seeds should be made to Plant Gene Resources of Canada, 107 Science Place, Saskatoon, SK, Canada S7N 0X2 indicating Accession No: CN 119052.

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Table 1. Performance of experimental line HS-171 and check cultivar OAC Thamesville in Southwest Ontario, 2012. The trial was conducted by Agriculture and Agri-Food Canada (AAFC) at Chatham, Harrow, Holiday Beach, Ridgetown, Blenheim and Woodslee, Ontario.

Cultivar	Seed							Plant	
	Yield	Maturity	Weight	Protein ^a	Oil ^a	Sucrose ^a	Carb ^{ac}	Height	Ldg
	(t/ha)	(d)	(g/100 seed)	%	%	%	%	(cm)	(1-5) ^b
HS-171	3.62a	135a	29.9a	44.9a	19.3a	7.0a	18.6a	97a	2.1a
OAC Thamesville	3.86a	129b	21.1b	42.4b	20.7b	6.7a	18.3a	94a	1.3a
SE ^d	0.59	4.57	4.9	1.14	0.94	0.65	0.71	3.4	1.1
No. Sites	6	5	6	6	6	6	6	5	5

^aWhole seed, dry matter basis, by near infrared spectroscopy (Yu et al. 2016).

^b1 = no lodging to 5 = complete lodging.

^cCarb is total hydrolysable carbohydrates (Poysa et al. 2013).

^dStandard errors between corresponding means of the trials at $p < 0.05$.

a, b in columns, means followed by different letters differ significantly.