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Registration of black-seeded douchi food grade soybean Germplasm, HS-172

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Abstract:

HS-172 is a black-seeded food grade soybean line (*Glycine max*. L.) suitable for use to make douchi or fermented, salt-preserved black soybean. It is adapted to areas of southwest Ontario with 3100 or more crop heat units and has a relative maturity of 2.5.

Key words: *Glycine max* (L.) Merr., Black Soybean, Douchi

The black-seeded food grade soybean line HS-172 {registered at the Plant Gene Resources of Canada (RGRC) with the Reg No: CN119097}, was developed by Agriculture and Agri-Food Canada (AAFC), Harrow Research and Development Centre (Harrow-RDC) at Harrow, Ontario for use to make douchi or fermented, salt-preserved black soybean and released in 2017. Black soybeans have a stronger inhibitory effect against low-density lipoprotein cholesterol (LDL) oxidation than yellow soybeans (Takahashi et al. 2005). Douchi is a popular food in China. It has been used as seasoning in foods and for medicinal purpose even before the Han Dynasty (206 BC). Today it is still added to some traditional Chinese medicines (Wang et al. 2007). HS-172 has significantly larger seed size and higher sucrose concentrations than the check cultivar and is adapted to areas of southwest Ontario with 3100 or more crop heat units and has a relative maturity of 2.5.

HS-172 has a pedigree of Evans-i/Honiku-i/3/Evans-i/Honiku65-3//Hokkaido Black/4/RCAT Dover with the last cross made in 2006. Evans-i is a black-seeded variant of the US commodity soy cultivar, Evans, which is resistant to phytophthora root rot (Lambert and Kennedy, 1975); Honiku-i is a black-seeded variant of the Japanese food soy cultivar, Honiku; Honiku65-3 is a phytophthora root rot resistant selection from Honiku65 (PI 360837); Hokkaido

Black (PI 84970) is a black-seeded line from Japan; RCAT Dover is a high yielding cultivar developed by the University of Guelph at Ridgetown campus (Stirling et al. 2005).

HS-172 was developed by pedigree selection. The F_1 and F_2 plants were grown in the greenhouse and in the field at Harrow, ON in 2006 and 2017, respectively. The seeds of the selected F_2 plants were sent to a winter nursery in Puerto Rico for two generations of seed advancement by modified single seed descent in 2017. The F_5 seeds were grown in a black seed (BL) winter nursery in the field at Harrow in 2008 with individual plant selection based on maturity, lodging resistance, yield potential, disease resistance, and apparent seed size. The selected plants were threshed individually and visual selection was made in the lab among the seed samples for size, shape, and colour; seed coat integrity; and uniformity of seed size and shape. The F_6 seeds of the selected plants were grown in a progeny row yield trial using a modified augmented type-2 design (Lin and Voldeng, 1989) in Harrow in 2009 and the line SB06-0138-bi-2 was selected based on yield, maturity, lodging resistance, plant height, and seed size in 2009. The F_7 seeds were evaluated for agronomic performance and seed quality in 2-row, 2-replication preliminary yield trials (PBL10) at Harrow and Woodslee in 2010; the F_8 seeds were evaluated in 5-row, 2-replication yield trials (AMIS11) at three locations (Harrow, Woodslee, and Malden, ON) in 2011; and the F_9 seeds were evaluated in 5-row, 3-replication yield trials (BYM12) at six locations (Harrow, Chatham, Ridgetown, Blenheim, Woodslee, and Malden, ON) in 2012. Fifty-two F_{10} plants selected from BYM12 were planted as plant breeder rows (PBR13) in 2013. Fourteen of the 52 lines were used to produce breeder seeds in 2014. A bulked sample of the breeder seeds was deposited with PGRC in March 2017 and given the Reg No. CN 119097.

The performance of HS-172 and the check cultivar, OAC Thamesville, is presented in Table 1. HS-172 had slightly but not significantly higher yields than OAC Thamesville. HS-172 had a large seed, being about 7g per 100 seed heavier than the check cultivar. The sucrose concentration of HS-172 was significantly higher than the check. HS-172 matured 2 days later than the check and was taller and more susceptible to lodging than the check. HS-172 has an indeterminate growth habit, purple flowers, and grey pubescence. The seeds are dull black with black hilum.

Requests for sample seeds should be made to PGRC, 107 Science Place, Saskatoon, SK, Canada S7N 0X2 indicating Accession No: CN 119077.

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References:

- Lambert, J.W. and Kennedy, B. W. 1975. Registration of Evans and Hodgson Soybeans. *Crop Sci.* 15: 735.
- Lin, C. S. and Voldeng, H. D. 1989: Efficiency of type 2 modified augmented designs in soybean variety trials. *Agron. J.* 81: 512_517.
- Poysa, V., Woodrow, L., and Yu, K. 2005. Effect of soy protein subunit composition on tofu quality. *Food Research International* 39:309–317.
- Stirling, B.T., Fisher, J.D., Zhao, G., and Ablett, G.R. 2005. RCAT Dover Soybean. *Canadian J. of Plant Sci.* 86: 473-474.

Takahashi, R., Ohmori, R., Kiyose, C., Momiyama, Y., Ohsuzu, F., and Kondo, K.

2015. Antioxidant activities of black and yellow soybeans against low density lipoprotein oxidation. *J Agric Food Chem.* 2005 Jun 1;53 (11):4578-4582.

Wang, D., Wang, L., Zhu, F., Zhu, J., Chen, X. D., Zou, L., Saito, M., and Li, L. 2007. In vitro and in vivo studies on the antioxidant activities of the aqueous extracts of Douchi (a traditional Chinese salt-fermented soybean food). *Food Chemistry* 107 (2008) 1421–1428.

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Table 1. Agronomic performance and seed quality of experimental line HS-172 and the check cultivar OAC Thamesville, in Southwest Ontario in 2012. The trial was conducted by Agriculture and Agri-Food Canada (AAFC) at Chatham, Harrow, Holiday Beach, Blenheim, Ridgetown and Woodslee, Ontario.

Cultivar			Seed					Plant	
	Yield	Maturity	Weight	Protein ^a	Oil ^a	Sucr ^a	Carb ^{ac}	Height	Lodging
	(t/ha)	(d)	(g/100 sd)	%	%	%	%	(cm)	(1-5) ^b
HS-172	3.95 ^a	131 ^a	27.3 ^a	42.3 ^a	20.8 ^a	7.8 ^a	18.6 ^a	105 ^a	1.9 ^a
OAC Thamesville	3.86 ^a	129 ^a	20.6 ^b	42.4 ^a	20.7 ^a	6.7 ^b	18.3 ^a	94 ^b	1.3 ^b
LSD	0.32	4.8	1.7	1.0	0.5	0.3	2.5	6.4	0.5
No. Sites	6	5	6	6	6	6	6	5	5

^a Grounded seed powder, dry matter basis, by near infrared spectroscopy (Poysa et al.2005).

^b 1= no lodging, 5 = complete lodging.

^c Carb is total hydrolysable carbohydrates.

^d LSD (least significant difference) between corresponding means of the trials ($p < 0.05$).

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