USDA
United States Department of Agriculture

Research, Education, and Economics
Agricultural Research Service

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
WASHINGTON, D.C.

and

NORTH DAKOTA
AGRICULTURAL EXPERIMENT STATION
FARGO, ND

NOTICE OF RELEASE OF HA-BSR6, HA-BSR7 AND HA-BSR8, OIL SUNFLOWER

Sclerotinia basal stalk rot (BSR), caused by Sclerotinia sclerotiorum (Lib.) de Bary, is a devastating disease in sunflower growing areas worldwide. No complete resistance has been identified in cultivated sunflower. However, higher levels of BSR resistance have been identified in wild annual Helianthus species. Three sunflower (Helianthus annuus L.) germplasms, HA-BSR6, HA-BSR7, and HA-BSR8 have been developed through introgression of genes from wild species to provide diverse sources of Sclerotinia BSR resistance. All three lines are also resistant to downy mildew caused by Plasmopara halstedii (Farl.) Berlese & de Toni that is also one of the most serious sunflower diseases.

HA-BSR6 to HA-BSR8 are BC2F5 derived BC2F6 maintainer oilseed sunflower lines selected from the cross HA 89/3/HA 458//NMSHA 89/PI 468853. HA 89 (PI 599773) is an inbred maintainer line released by USDA and the Texas Agricultural Experiment Station in 1971. The nuclear male sterile line NMSHA 89 (PI 559477) was induced by streptomycin treatment of HA 89 that possessed a single nuclear recessive male sterility gene ms9, released by the UDSA and the North Dakota Agricultural Experiment Station, Fargo, ND in 1990. HA 458 (PI 655009) is a high oleic and downy mildew resistant germplasm (carrying the Pl17 resistance gene) released by USDA and the North Dakota Agricultural Experiment Station, Fargo, ND in 2010. PI 468853 is an accession of wild annual Helianthus praecox Engelm & Gray subsp. runyonii Heiser collected in Texas in 1981 and identified as resistant to Sclerotinia BSR.

The initial cross of NMSHA 89 with the selected resistant plants from PI 468853 was made in 2009 followed by backcrossing and pedigree selection methods. Sclerotinia BSR screenings were conducted in the greenhouse under controlled conditions for the resistant wild species donor parent and the early generations of F1, BC1, BC2, and BC2F2. The selected lines, HA-BSR6, HA-BSR7, and HA-BSR8, were tested for resistance to BSR in inoculated field nurseries across seven environments from 2012 to 2015 in North Dakota and Minnesota, and consistently showed high levels of BSR resistance across all environments. Average disease incidence of

basal stalk rot for HA-BSR6, HA-BSR7, and HA-BSR8 was 4.8, 1.2, and 2.2 pecent, respectively, compared to an average of 36.1 percent for Cargill 270 (susceptible hybrid check), 31.0 percent for HA 89 (recurrent parent), 19.5 percent for HA 441 (resistant check), and 11.6 percent for Croplan 305 (resistant hybrid check).

A whole genome scan was performed using a genotyping-by-sequencing (GBS) approach to detect the presence of H. praecox segments in the HA-BSR6, HA-BSR7, and HA-BSR8 lines. Polymorphic single nucleotide polymorphism markers revealed the presence of introgressed chromosome segments in HA-BSR6 located on linkage groups (LG) 8 and 10, HA-BSR7 on LGs 1, 8, and 10, and HA-BSR8 on LGs 1 and 6.
HA-BSR6, HA-BSR7, and HA-BSR8 likely carry different H. praecox segments associated with BSR resistance.

HA-BSR6, HA-BSR7, and HA-BSR8 are also homozygously resistant to downy mildew that was confirmed by greenhouse testing and DNA markers linked to the gene Pl17, which was derived from HA 458. The high oleic acid trait was not transferred to any of the HA-BSR germplasms from HA 458.

Plant heights of HA-BSR6, HA-BSR7, and HA-BSR8 were 160, 134, and 128 cm, respectively compared to 119 and 127 cm, respectively for the parents HA 89 and HA 458. The HA-BSR lines flowered in 73, 87, and 83 days after planting, respectively, compared to 68 days for HA 89 and 72 days for HA 458, all grown in a field nursery at Glyndon, MN during the summer of 2015.

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Signatures:

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12/12/16
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10/3/2017
Date