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AND

NORTH DAKOTA AGRICULTURAL EXPERIMENT STATION
North Dakota State University
Fargo, ND

**NOTICE OF RELEASE OF OIL SUNFLOWER GERMPLASMS HR MAX 1018+1323
and HR NUT 1324+1008**

The most significant disease threat to sunflower (*Helianthus annuus* L.) production in humid temperate, as well as tropical and subtropical regions of the world is *Sclerotinia sclerotiorum* (Lib.) de Bary, a necrotrophic fungus that causes three distinctly different diseases on sunflower: basal stalk rot or wilt, mid-stalk rot, and head rot. Head rot (HR) is a serious problem in sunflower growing areas of the USA, especially the northern Great Plains that starts by carpogenic germination of buried sclerotia under moist conditions that produce apothecia, which produce airborne ascospores that infect the heads. Management tools for controlling this disease are insufficient; crop rotation is of marginal use due to the long-lived nature of the sclerotia, foliar fungicide application (commonly used for management of white mold in other crops) is not useful due to the unique infection process in sunflower, fungicide seed treatments provide insufficient control, and the present-day hybrids and cultivated lines lack sufficient tolerance and resistance. HR resistance is genetically complex and quantitatively conditioned by multiple genes, each having a small effect. Low levels of resistance are available in some inbred lines and hybrids, but greater levels of resistance are needed to combat this emerging pathogen, providing a more efficient, durable and environmentally friendly host plant resistance.

HR MAX 1018+1323 is a bulk of four backcross progeny families with the *Sclerotinia* HR resistance genes derived from perennial *Helianthus maximiliani* (MAX 1018 and MAX 1323) accessions from Agriculture and Agri-Food Canada, Morden, Manitoba. The pedigrees of the four families for this release are: NMS HA 89/MAX 1018//HA 441, BC1F2/3/HA 441, BC2F3; NMS HA 89/MAX 1018//HA 441, BC1F2/3/HA 441, BC2F4; NMS HA 89/MAX 1018//3*HA 441, BC3F3; and NMS HA 89/MAX 1323//HA 441, BC1F5. HA 441 (PI 639164) is an oilseed maintainer line developed and jointly released in 2003 by the USDA-ARS and North Dakota Agricultural Experiment Station at Fargo, ND for tolerance to *Sclerotinia* head rot caused by *Sclerotinia sclerotiorum*. NMS HA 89 (PI 559477) is an induced nuclear male sterile line

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released by the USDA-ARS and North Dakota Agricultural Experiment Station, Fargo, ND in 1990.

HR NUT 1324+1008 is a bulk of three backcross progeny families with HR resistance genes derived from *Helianthus nuttallii* (NUT 1324 and NUT 1008) accessions from Agriculture and Agri-Food Canada, Morden, Manitoba. The pedigrees of the three families for this release are: NMS HA 89/NUT 1324// 2*HA 441, BC2F3; NMS HA 89/NUT 1008//HA 441, BC1F6; and NMS HA 89/NUT 1008//2*HA 441, BC2F3. Recurrent parents HA 411 and NMS 89 are described above.

Sclerotinia head rot resistance of HR MAX 1018+1323 and HR NUT 1324+1008 was determined under artificially inoculated field screening in misted nurseries located at the NDSU, Carrington Research and Extension Center at Carrington, ND, in 2009 and 2014, the Central Lakes College Agricultural and Energy Center in Staples, MN, 2010, 2012, and 2014, and the Bayer Crop Science research station, Sabin, MN in 2011. Heads of plants were inoculated with ascospores produced from fungal isolate NEB 274 during bloom, with plots mist irrigated after inoculation for three weeks to ensure proper humidity conditions for spore germination and infection. Severity was determined by scoring each individual head on a 0 to 5 scale (0 for uninfected; 5 for all sections of the head infected). Disease incidence (DI) was the number of plants infected (severity rated 1 to 5) of the total number of plants in the plot.

Average severity of HR MAX 1018+1323 was 0.9 and DI 18.9 percent, while HR-NUT 1324+1008 was 1.1 and DI 24.5 percent, compared to susceptible hybrid check Cargill/Mycogen 270 with 3.3 severity and DI 70 percent, and tolerant hybrid checks Croplan 305 with 2.7 and DI 59 percent, and Croplan 343 with 1.7 and DI 45 percent. Recurrent parents HA 441 had a severity of 2.3 and DI 51 percent, and HA 89 with 3.3 and DI 72 percent.


Agronomic data was taken from plants grown in a field nursery at Fargo, ND during the summer of 2014. Plants of HR MAX 1018+1323 and HR NUT 1324+1008 were segregating for branching with plant heights of 105 and 127 cm, respectively compared to the single headed check hybrid 894 of 114 cm; days to 50 percent flowering was 81 and 79 days, respectively compared to the check of 71 days; days to maturity was 132 and 131, compared to 123 for the check; head diameter was 16 and 19 cm, compared to 24cm for the check; and 1000-seed weight was 48 grams for both, compared to the check with 62 grams.

Small quantities of seed of the HR MAX 1018+1323 and HR-NUT 1324+1008 germplasms will be available from the North Dakota Foundation Seedstocks Project, Department of Plant Sciences, NDSU Dep. 7670, P. O. Box 6050, Fargo, ND 58108-6050. Seed of this release will also be deposited in the USDA National Plant Germplasm System, where it will be available for research purposes, including development and commercialization of new cultivars. U.S. Plant Variety Protection will not be pursued for HR MAX 1018+1323 and HR NUT1324+1008.

It is requested that appropriate recognition be made if these germplasms contribute to the development of a new germplasm, breeding lines or cultivar. These germplasms were developed with the support of the USDA-ARS National Sclerotinia Initiative.


ARS GIVES NO WARRANTIES OR GUARANTEES, EXPRESSED OR IMPLIED FOR THE MATERIAL, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Signatures:



Vice President for Agricultural Affairs
North Dakota State University

3/27/17
Date



Deputy Administrator, Crop Production and Protection
Agricultural Research Service, U.S. Department of Agriculture

4/5/17
Date