



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

**NOTICE OF RELEASE OF OILSEED SUNFLOWER GERMPLASMS RHA 485,  
RHA 486, and HA 487**

The United States Department of Agriculture, Agricultural Research Service (USDA-ARS) announces the release of three oilseed sunflower germplasms in 2017. These germplasms have been developed to provide diversity for resistance to *Sclerotinia* head and basal stalk rot [caused by *Sclerotinia sclerotiorum* (Lib.) de Bary], *Phomopsis* stalk canker [caused by *Diaporthe* spp.], and downy mildew [caused by *Plasmopara halstedii* (Farlow) Berlese & de Toni] in a high yielding genetic background, and are available for use by industry and public researchers to create parental lines or germplasms.

**Germplasm Pedigree Descriptions:**

RHA 485 is a *Sclerotinia* head rot and basal stalk rot resistant, *Phomopsis* stalk canker resistant F7-derived F8 restorer oilseed sunflower line selected from the cross RHA 463/Almanzor. RHA 463 was developed by the USDA-ARS and the North Dakota Agricultural Experiment Station (NDAES) in 2006. Almanzor was a hybrid evaluated in the Food and Agriculture Organization (FAO) Hybrid Sunflower Yield Trial.

RHA 486 is a imidazolinone tolerant, downy mildew resistant, *Sclerotinia* head and basal stalk rot resistant, *Phomopsis* stalk canker resistant F8-derived F9 restorer oilseed sunflower line selected from the cross RHA 428/RHA 426//CAR 125/AS 4379/3/France R-line bulk. RHA 426 and RHA 428 are restorer inbred germplasms possessing imidazolinone herbicide tolerance and downy mildew resistance conditioned by a single gene, respectively. CAR 125 is a semi-short statured hybrid developed by Cargill and entered into the FAO Hybrid Sunflower Yield Trial. AS 4379 is a hybrid entered into the FAO Hybrid Sunflower Trial that was developed by Dr. Philippe Lesigne in France. France R-line bulk was a collection of pollen from several restorer lines obtained from Dr. Felicity Vear, Institut National de la Recherche Agronomique (INRA), Clermont-Ferrand, France.

HA 487 is an imidazolinone tolerant, *Sclerotinia* head rot resistant, high oleic F8-derived F9 maintainer oilseed sunflower line selected from the cross HA 466/French B-line bulk. HA 466 (PI 667183) is a *Sclerotinia* resistant oilseed maintainer line released by the USDA and the NDAES in 2006. French B-line bulk was a collection of pollen from several maintainer lines obtained from Dr. Felicity Vear, Institut National de la Recherche Agronomique (INRA), Clermont-Ferrand, France.

**Sclerotinia Head Rot Evaluations:** Testcross hybrids were evaluated at the Bayer CropScience research station at Sabin, MN in 2011 and 2012; Central Lakes College Agriculture and Energy

Center in Staples, MN, in 2011, 2012, 2014, 2015, and 2016; and Carrington Research and Extension Center, Carrington, ND, in 2014, 2015, and 2016, under artificially inoculated conditions. Ascospores of *Sclerotinia sclerotiorum* pv. 'NEB 274' were sprayed on each head in each plot during bloom, and the plots subjected to mist irrigation to ensure proper conditions for spore germination and infection. Incidence and severity were measured by scoring each individual plant on a 0 to 5 scale for severity (0 for uninfected; 5 for all quadrants of the head infected), and considering any plant with a score of 1 to 5 as being infected in order to determine percentage incidence.

Sclerotinia head rot resistance of RHA 485, RHA 486, and HA 487 was evaluated on testcross hybrids of RHA 485 with HA 412HO (PI 642777) and HA 467 (PI 670489), RHA 486 with HA 412HO and HA 467, and HA 487 with RHA 464 (PI 655015) and RHA 468 (PI 667184). Best linear unbiased estimates of head rot over environments and replications for these six testcross hybrids was 21.7, 0.0, 43.1, 29.4, 38.9, and 32.7 percent, respectively, compared to an average of 65.9 percent for Cargill 270, 27.1 for NK 277, 57.3 for Croplan 305, and 38.2 for Croplan 343. All testcross hybrids were statistically superior to susceptible check Cargill 270, and all except HA 487/RHA 464 and HA 412HO/RHA 486 were also statistically superior to the highly resistant check Croplan 305 ( $p < 0.05$ ). RHA 485, RHA 486, and HA 487 confer a high level of resistance to *Sclerotinia* head rot.

**Sclerotinia Basal Stalk Rot Evaluations:** *Sclerotinia* basal stalk rot resistance evaluations were conducted on the same testcross hybrids as in the head rot evaluations. The hybrids were tested at the Croplan Genetics field site at Crookston, MN, in 2012; Carrington Research and Extension Center in Carrington, ND, in 2011, 2012, 2014, and 2015; the CHS field site in Grandin, ND, in 2014, and Central Lakes College Agriculture and Energy Center in Staples, MN, in 2016 under artificially inoculated conditions. Millet grain infested with live mycelia of *Sclerotinia sclerotiorum* pv. 'NEB 274' was sidedressed in the root zone of the plants using a tractor-mounted Gandy applicator. Incidence was measured after physiological maturity as the percentage of plants exhibiting the sign of mycelia at the base of the stalk.

Best linear unbiased estimates of basal stalk rot incidence over environments and replications for the six testcross hybrids was 49.7, 0.0, 14.7, 10.6, 29.1, and 51.6 percent, respectively, compared to an average of 36.8 percent for Cargill 270, 11.0 for NK 277, 11.4 for Croplan 305, and 22.9 for Croplan 343. HA 412HO/RHA 486, HA 467/RHA 485, and HA 467/RHA 486 were all statistically superior to the susceptible check Cargill 270 ( $p < 0.05$ ), and similar to the resistant checks, indicating that RHA 485 and RHA 486 confer high levels of resistance to *Sclerotinia* basal stalk rot.

**Yield, Phomopsis Stalk Canker, and Agronomic Evaluations:** Yield and oil content of RHA 485, RHA 486, and HA 487 were determined by evaluating the same six testcross hybrids as above. Eastern mega-environment locations were on-farm locations near Wyndmere, ND, in 2012, and Glyndon, MN, in 2015 and 2016. Western mega-environment locations included an on-farm location near Eureka, SD, in 2012, and the USDA-ARS Northern Great Plains Agricultural Research Laboratory in Mandan, ND, in 2015 and 2016. Best linear unbiased estimates of seed yield of the six testcross hybrids were 2621, 2871, 2586, 2685, 2675, and 2541 kg ha<sup>-1</sup>, compared to 2878 for Croplan 3080, 2984 for Mycogen 8H449 CL DM, 2722 for Nuseed Camaro II, 2864 for Pannar 7813 NS, and 2824 kg ha<sup>-1</sup> for Syngenta 7717 HO CL DM, which are high yielding commercial hybrids. Testcross yields were statistically similar to the commercial checks, except that HA 412HO/RHA 486 and HA 487/RHA 468 were statistically inferior to Mycogen 8H449 CL DM ( $p < 0.05$ ). Best linear unbiased estimates of oil content were 456, 435, 427, 392, 405, and 412 g kg<sup>-1</sup> seed mass,

compared to 445, 449, 423, 415, and 411 for Croplan 3080, Mycogen 8H449 CL DM, Nuseed Camaro II, Pannar 7813 NS, and Syngenta 7717 HO CL DM, respectively. Hybrids with RHA 485 were similar or superior to all commercial checks for oil content, and HA 412HO/RHA 486, HA 487/RHA 464, HA 487/RHA 468 were statistically similar to Nuseed Camaro II, Pannar 7813 NS, and Syngenta 7717 HO CL DM ( $p < 0.05$ ). Best linear unbiased estimates for Phomopsis stalk canker incidence in the six testcross hybrids were 9.9, 8.5, 0.0, 0.0, 24.8, and 39.2, respectively, compared to 50.5, 38.0, 23.1, 47.6, and 26.2 for Croplan 3080, Mycogen 8H449 CL DM, Nuseed Camaro II, Pannar 7813 NS, and Syngenta 7717 HO CL DM, respectively. All comparisons of testcrosses with commercial checks showed the testcrosses to be statistically similar or superior. Both testcrosses with RHA 486 were statistically superior to all the commercial checks, and both of the testcrosses with RHA 485 were statistically superior to Croplan 3080 and Pannar 7813 NS ( $p < 0.05$ ). This shows that these materials have moderate to very high relative resistance to Phomopsis stalk canker while maintaining similar yield and oil content to several commercial checks.

Availability: Small quantities of seed of each germplasm will be available from the North Dakota Foundation Seed Stocks Project, NDSU Dept. 7670, P.O. Box 6050, Fargo, ND 58108-6050. Seed of these releases will be deposited in the National Plant Germplasm System, where it will be available for research purposes. U.S. Plant Variety Protection will not be requested for RHA 485, RHA 486, and HA 487.

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

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Signature:

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Date