



UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Services
Washington, D.C.

and

NORTH DAKOTA STATE UNIVERSITY
Fargo, ND

NOTICE OF RELEASE OF HA-R18 AND HA-R19

Sunflower rust, incited by the fungus *Puccinia helianthi* Schwein., is a serious fungal disease in the sunflower growing areas worldwide with an increasing importance in North America in recent years due to the frequent evolution of new pathogen races. The emergence of novel pathogen virulence through either sexual or asexual reproduction has rendered most of the commercial hybrids susceptible to rust, which could lead to epidemics when weather conditions are conducive for disease development. Therefore, it is necessary to discover novel rust resistance genes for breeding efforts, and ultimately, long term management of sunflower rust. HA-R18 and HA-R19 were developed with resistant to the most predominant and virulent *P. helianthi* races, 336 and 777, respectively, providing valuable germplasms for breeder to use in breeding programs.

HA-R18 is an oilseed maintainer selection from KP193. A total of 58 cultivated oilseed sunflower lines including KP193 and KP199 (see below) introduced from the Agricultural Research Council, Grain Crops Institute, Potchefstroom, South Africa in 2012 were tested for their reaction to rust infection. The results indicated that KP193 had resistance to *P. helianthi* races, 336 and 777, respectively, but was segregating. The resistant seedlings (S0) selected from KP193 were transplanted and self-pollinated in the greenhouse. Of 32 plants from a single S1 head (14-76-1), four S1 plants were susceptible, while 24 S1 plants were resistant to rust and advanced to the S2 generation. Homozygous plants were selected from 24 S2 families tested using *P. helianthi* race 336. S3 seed selected from the homozygous resistant S2 families was planted in the summer field nursery in 2017, and the harvested S4 seed was bulked to form the germplasm HA-R18 originally selected from KP193. Of 11 *P. helianthi* races tested, HA-R18 exhibited resistance to eight including *P. helianthi* races, 336 and 777. Inheritance studies indicated that the rust resistance was controlled by a single dominant gene in HA-R18 named R17 mapped to chromosome 13 within a large gene cluster. Plant height of HA-R18 was 191 cm compared to 183 cm for the standard check hybrid 894, and flowers in 76 days after planting compared to 69 days for hybrid 894 in the field nursery at Glyndon, MN during the summer of 2017.

HA-R19 is an oilseed maintainer selection from KP199. Rust screening indicated that KP199 was resistant to *P. helianthi* races, 336 and 777, respectively, but was segregating for rust. The resistant seedlings (S0) identified from KP199 were transplanted and self-pollinated in the greenhouse. Interestingly, thirty-two of the S1 plants from a single S1 head (14-77-2) were all resistant to rust. To confirm the homozygous nature of the S1 plants, 11 S2 families (24 plants for each family) were tested using *P. helianthi* race 336. All S2 families exhibited homozygous resistance with no segregation. S3 seed selected from the homozygous resistant S2 families was planted in the summer field nursery in 2017, and the harvested S4 seed bulked to form the HA-R19 germplasm originally selected from KP199. Of the 11 *P. helianthi* races tested, HA-R19 exhibited resistance to nine including *P. helianthi* races, 336 and 777. Inheritance studies indicated that the rust resistance was controlled by a single dominant gene in HA-R19 named R18 mapped to chromosome 13 within a large gene cluster. Plant height of HA-R18 was 189 cm compared to 183 cm for the standard check hybrid 894, and flowers in 70 days after planting compared to 69 days for hybrid 894 in the field nursery at Glyndon, MN during the summer of 2017.

Small quantities of seed of the HA-R18 and HA-R19 germplasm 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 these releases 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 HA-R18 and HA-R19.

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

Signatures:

Vice President, Agricultural Affairs
North Dakota State University

08/25/2020

Date

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

Date