Registration of Two Restorer (RHA 439 and RHA 440) and One Maintainer (HA 441) Sclerotinia Tolerant Oilseed Sunflower Germplasms

Two restorer and one maintainer oilseed sunflower (Helianthus annuus L.) germplasms were developed and released by the USDA-ARS, Fargo, ND, and the North Dakota Agricultural Experiment Station, Fargo, ND, in 2003; RHA 439 (Reg. no. GP-293, PI 639162), RHA 440 (Reg. no. GP-294, PI 639163), and HA 441 (Reg. no. GP-295, PI 639164). These germplasms are available for use by the sunflower industry and public researchers to create hybrids, parental lines, or germplasms with improved Sclerotinia [caused by Sclerotinia sclerotiorum (Lib.) de Bary] head rot tolerance.

RHA 439 is an F7–derived F8 restorer line selected from the cross RHA 377/AS 3211. RHA 440 is an F7–derived F8 restorer line selected from the cross RHA 377/AS 4379. RHA 377 (PI 560145) is a restorer line released by the USDA-ARS and the North Dakota Agricultural Experiment Station in 1990 (Miller, 1992). AS 3211 and AS 4379 are hybrids developed in France by Dr. Philippe Lesigne and entered into the 1995–1996 Food and Agriculture Organization (FAO) Hybrid Sunflower Yield Trial. RHA 439 and RHA 440 have genes for fertility restoration of the PET1 (Serieys, 1996) cytoplasmic male sterility and have upper-stem branching conditioned by a recessive gene.

The pedigree breeding method was used to develop RHA 439 and RHA 440. Sclerotinia head rot tolerance of these lines was selected by evaluating testcross hybrids that were artificially inoculated under mist irrigation at the North Dakota Agricultural Experiment Station, Carrington Research and Extension Center, Carrington, ND, during the 2000 to 2002 summer seasons. Height of RHA 439 and RHA 440 was 140 and 150 cm, respectively, compared to a height of 138 cm for RHA 377. Days to flower of RHA 439 and RHA 440 were 63 and 67 d, respectively, compared to 62 d for RHA 377.

HA 441 is an F7–derived F8 maintainer line selected from the cross HA 412/SD. HA 412 (PI 603993) is a maintainer line released by the USDA-ARS and the North Dakota Agricultural Experiment Station in 1995 (Miller and Gulya, 1999). SD is a maintainer line obtained through a germplasm exchange with Dr. Felicity Vear, Station d’Amélioration des Plantes, INRA, Clermont-Ferrand, France. The pedigree breeding method was used to develop HA 441. Sclerotinia tolerance of this line was selected by evaluating testcross hybrids that were artificially inoculated under mist irrigation. Height of HA 441 was 160 cm compared to a height of 145 cm for HA 412. Days to flower of HA 441 were 61 d compared to 56 d for HA 412.

Hybrids with the two restorer lines, RHA 439 and RHA 440, were produced by crossing with CMS HA 412. Hybrids with the maintainer line, HA 441, were produced by crossing the cytoplasmic male-sterile equivalent of HA 441 with the restorer line RHA 377. These hybrids were compared with the commercial hybrids Pioneer 63M80, Interstate Hysun 530, and Mycogen 8377 in 2000, 2001, and 2002 trials planted at Casselton, ND, for hybrids Mycogen SF 270, Mycogen 8377, Pioneer Syngenta 278 under mist irrigation at Carrington, SD. Sclerotinia tolerance evaluation. Yield of hybrids RHA 439, RHA 440, and HA 441 was 2175, 2371, and 1983 kg ha⁻¹, respectively, compared to a 2238 kg ha⁻¹ average for the check hybrids. Oil content of hybrids with RHA 439, RHA 440, and HA 441 was 473, 462, and 454 g kg⁻¹, respectively, compared to a 464 g kg⁻¹ average for the three check hybrids. Height of hybrids with RHA 439, RHA 440, and HA 441, 165, and 190 cm, respectively, compared to a 164 cm average for the three check hybrids. Days to flower of hybrids RHA 439, RHA 440, and HA 441 were 68, 70, and 69, respectively, compared to a 68 d average for the three check hybrids.

Sclerotinia head rot tolerance was determined as follows. Ten plants per plot with a suspension of 500 mL of distilled water. A total of 5 mL was sprayed on the same day. Mist irrigation was applied for 5 min every half-hour commencing after inoculation began. Disease incidence, measured as percentage of plants showing symptoms of head rot for each plot, was recorded 35 d after inoculation. Disease incidence averaged over all 3 yr of hybrids with RHA 439, RHA 440, and HA 441 was 16, 33, and 8%, respectively.

Limited quantities of seed of each germplasm are available from the Seedstocks Project, Dep. of Plant Sciences, Loftsgard Hall, North Dakota State University, Fargo, ND. Limited quantities of seed of each germplasm are available for research, teaching, and breeding purposes. U.S. Plant Variety Protection will not be requested for RHA 439, RHA 440, or HA 441.

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References

Miller, J.F. 1992. Registration of five oilseed sunflower restorer lines (RHA 373 to 377) and two nuclear maintainer lines (NMS 274 and 801). Crop Sci. 32:1298.


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