Registration of Two Maintainer (HA 451 and HA 452) and Three Restorer (RHA 453–RHA 455) Sclerotinia-Tolerant Oilseed Sunflower Germplasms

Two maintainer and three restorer 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 2005: HA 451 (Reg. no. GP-317, PI 642770), HA 452 (Reg. no. GP-318, PI 642771), RHA 453 (Reg. no. GP-319, PI 642772), RHA 454 (Reg. no. GP-320, PI 642773), and RHA 455 (Reg. no. GP-321, PI 642774). These germplasms were selected for their tolerance to Sclerotinia head and stalk rot [caused by Sclerotinia sclerotiorum (Lib.) de Bary], a major sunflower disease, and also because they provide diversity for agronomic characteristics and oil quality. These germplasms are available for use by industry and public researchers to create hybrids, parental lines, or germplasms with increased tolerance to Sclerotinia head and stalk rot.

HA 451 is an F₆-derived F₇ maintainer line advanced by pedigree selection from the cross HA 411/Fuksinka 10. HA 411 (PI 603992) is a maintainer germplasm line released by USDA-ARS and the North Dakota Agricultural Experiment Station in 1995 (Miller and Gulya, 1999). Fuksinka 10 (Ames 3300) was obtained from Germany in 1985 and was tested for Sclerotinia stalk rot tolerance from 1992 to 1995 under natural infestation in selected fields in North Dakota and Minnesota and averaged 26.7% infection compared with a standard check HA 89 (PI 599773), which averaged 47.8% infection. HA 89 is an oilseed maintainer line released by the USDA-ARS and the Texas Agricultural Experiment Station in 1971.

HA 452 is an F₆-derived F₇ maintainer line advanced by pedigree selection from the cross HA 335/HA 412. HA 335 (PI 518773) is a maintainer germplasm line released by USDA-ARS and the North Dakota Agricultural Experiment Station in 1987 (Miller and Gulya, 1988). HA 412 (PI 603993) is a maintainer germplasm line released by USDA-ARS and the North Dakota Agricultural Experiment Station in 1995 (Miller and Gulya, 1999). HA 452 has the Pl₈ gene for downy mildew resistance [caused by Plasmopara halstedii (Farl.) Berl. & De Toni in Sacc.], imparting resistance to all known North American races.

Height of HA 451 was 138 cm, compared with 123 cm for the maternal parent HA 411. Height of HA 452 was 140 cm, compared with 139 cm for the maternal parent HA 335. Days to flower for HA 451 was 68 d compared with 63 d for HA 411. Days to flower for HA 452 was 67 d, compared with 63 d for HA 335. HA 451 and HA 452 are single-headed.

Sclerotinia head rot tolerance of these lines was evaluated using testcross hybrids that were artificially inoculated under mist irrigation in 2003 and 2004 at Carrington Research and Extension Center, Carrington, ND. Percent infection of HA 451 and HA 452 in the testcross hybrids was 12.5 and 23.0%, respectively, compared with the resistant check hybrid NK 278 with 70 d for RHA 440. RHA 453 to RHA 455 have fertility restorer germplasm line advanced by pedigree selection from the cross RHA 440/Fuksinka 10. RHA 440 (PI 639163) is a Sclerotinia head rot tolerant germplasm line released by the USDA-ARS and the North Dakota Agricultural Experiment Station in 1986 (Miller et al., 2006). RHA 440 is an F₆-derived fertility restorer germplasm line advanced by pedigree selection from the cross RHA 440/Fuksinka 10. Fuksinka 10 (Ames 3300) was obtained from Germany in 1985 and was tested for Sclerotinia stalk rot tolerance from 1992 to 1995 under natural infestation in selected fields in North Dakota and Minnesota and averaged 26.7% infection compared with a standard check HA 89 (PI 599773), which averaged 47.8% infection. HA 89 is an oilseed maintainer line released by the USDA-ARS and the Texas Agricultural Experiment Station in 1971.

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Sclerotinia head rot tolerance of these lines was evaluated using testcross hybrids that were artificially inoculated under mist irrigation in 2003 and 2004 at the North Dakota Agricultural Experiment Station, Carrington Research and Extension Center, Carrington, ND. Percent infection of HA 451 and HA 452 in the testcross hybrids was 12.5 and 23.0%, respectively, compared with the resistant check hybrid NK 278 with 24.9%, and the susceptible check hybrid SF 270 with 73.2% infection. HA 451 to RHA 455 were produced by crossing to two cytoplasmic male-sterile lines, CMS HA 451, CMS HA 452, and CMS HA 434 (PI 633774). These hybrids were produced by crossing with Dr. Felicity Vear, Station d’Amelioration des Plantes, INRA, Clermont-Ferrand, France.

RHA 455 is an F₆-derived fertility restorer germplasm line advanced by pedigree selection from the cross RHA 440/PI 642774. PSC 8 is a Sclerotinia head rot tolerant germplasm line obtained through a germplasm exchange with Dr. Florin Stoenescu, Advanta North America, West Fargo, ND.

Plants of RHA 453, RHA 454, and RHA 455 were produced in the 2004 breeding nursery at Fargo, ND, and evaluated with the commercial hybrids Pioneer 63M80, Interstate Hysun 1414, Mycogen 8377, Interstate Pioneer 6355, and Interstate Pioneer 6377 in 2003 and 2004 trials planted at Casselton, ND, for agronomic evaluation. Yield of hybrids with HA 451, HA 452, RHA 453, RHA 454, and RHA 455 was 77, 76, 76, 75, and 77 kg ha⁻¹, respectively, compared with a 74 d average of the three check hybrids. Days to flower of hybrids with HA 451, HA 452, RHA 453, RHA 454, and RHA 455 was 77, 76, 76, 75, and 75 d, respectively, compared with a 74 d average of the three check hybrids. Days to flower for HA 451, HA 452, RHA 453, RHA 454, and RHA 455 was 67, 67, and 66 d, respectively, compared with a 74 d average of the three check hybrids. Days to flower for RHA 453, RHA 454, and RHA 455 was 115 cm for RHA 440. Days to flower for RHA 453, RHA 454, and RHA 455 was 67, 67, and 66 d, respectively, compared with a 74 d average of the three check hybrids. Days to flower for RHA 453, RHA 454, and RHA 455 was 115 cm for RHA 440. Days to flower for RHA 453, RHA 454, and RHA 455 was 67, 67, and 66 d, respectively, compared with a 74 d average of the three check hybrids. Days to flower for RHA 453, RHA 454, and RHA 455 was 115 cm for RHA 440. Days to flower for RHA 453, RHA 454, and RHA 455 was 67, 67, and 66 d, respectively, compared with a 74 d average of the three check hybrids. Days to flower for RHA 453, RHA 454, and RHA 455 was 115 cm for RHA 440. Days to flower for RHA 453, RHA 454, and RHA 455 was 67, 67, and 66 d, respectively, compared with a 74 d average of the three check hybrids. Days to flower for RHA 453, RHA 454, and RHA 455 was 115 cm for RHA 440. Days to flower for RHA 453, RHA 454, and RHA 455 was 67, 67, and 66 d, respectively, compared with a 74 d average of the three check hybrids. Days to flower for RHA 453, RHA 454, and RHA 455 was 115 cm for RHA 440. Days to flower for RHA 453, RHA 454, and RHA 455 was 67, 67, and 66 d, respectively, compared with a 74 d average of the three check hybrids. Days to flower for RHA 453, RHA 454, and RHA 455 was 115 cm for RHA 440. Days to flower for RHA 453, RHA 454, and RHA 455 was 67, 67, and 66 d, respectively, compared with a 74 d average of the three check hybrids.