

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

And

THE NORTH DAKOTA AGRICULTURAL EXPERIMENT STATION
NORTH DAKOTA STATE UNIVERSITY
Fargo, North Dakota

NOTICE OF RELEASE OF IMIDAZOLINONE HERBICIDE-RESISTANT MAINTAINER (HA 442) AND
RESTORER (RHA 443) OILSEED SUNFLOWER GERMPLASMS

The United States Department of Agriculture, Agricultural Research Service, and the North Dakota Agricultural Experiment Station, North Dakota State University, announce the release of one maintainer (HA 442) and one restorer (RHA 443) oilseed sunflower germplasm. These germplasms are resistant to the imidazolinone herbicide imazamox (Raptor, BASF Corporation, Mount Olive, NJ) [(±)-2[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-5-methoxymethyl-3-pyridinecarboxylic acid] and are available for use by industry and public researchers to create hybrids, parental lines, or improved germplasms with resistance to imidazolinone herbicides.

HA 442 is an F₆-derived F₇ maintainer line selected from the cross HA 425/87CAEB//HA 434/HA 412 with high oleic fatty acid concentration. HA 425 is an imidazolinone herbicide-resistant maintainer line released in 2000 by USDA and the North Dakota Agricultural Experiment Station selected from the cross HA 89*3/PUR *H. annuus*. PUR *H. annuus* was selected from a wild *Helianthus annuus* L. population collected in Kansas by Dr. K. Al-Khatib and had resistance to imidazolinone herbicides. 87CAEB is a short-statured line with excellent lodging resistance obtained through a germplasm exchange with W. Vermeulen, Oil and Protein Seed Centre, Potchefstroom, South Africa. HA 434 is a high-oleic maintainer line and HA 412 is a Sclerotinia stalk rot resistant maintainer line released by USDA and the North Dakota Agricultural Experiment Station in 1999 and 1995, respectively. The pedigree breeding method was used to develop HA 442. Plants in the F₂ through F₆ generations were treated with imazamox dispersed in water at the 2X (70 g ha⁻¹) rate in the summer field breeding nurseries, Fargo, ND. In each generation, resistant plants were identified and self-pollinated. Analyses for oleic concentration were conducted on seed harvested from F₃ to F₆ plants by gas chromatography. The oleic concentration of HA 442 was 85.1%. Height of HA 442 was 125 cm compared with 123 cm for HA 434. Days to flower of HA 442 was 66 d compared with 63 d for HA 434.

RHA 443 is an F₆-derived F₇ restorer line selected from the cross RHA 426/RHA 419//RHA 377/AS 4379. RHA 426 is an imidazolinone herbicide-resistant restorer line released in 2000 by USDA and the North Dakota Agricultural Experiment Station. RHA 419 is a downy mildew [caused by *Plasmopara halstedii* (Farl.) Berl. & De Toni in Sacc.] resistant line released by USDA and the North Dakota Agricultural Experiment Station in 1999. RHA 377 is a restorer line released by USDA and the North Dakota Agricultural Experiment Station in 1990. AS 4379 is a hybrid developed in France by Dr. Philippe Lesigne and entered into the 1995-1996 Food and Agriculture Organization (FAO) Hybrid Sunflower Yield Trial. The pedigree breeding method was used to develop RHA 443. Plants in the F₂ through F₆ generations were treated with imazamox dispersed in water at the 2X (70 g ha⁻¹) rate in the summer field breeding nurseries, Fargo, ND. In each generation, resistant plants were identified and self-pollinated. Resistance to downy mildew race 730 was tested on seed harvested from plants in the F₃ through F₆ generations, and races 770, 733, and 304 was tested on seed harvested from plants in the F₅ and F₆ generations. Only resistant plants were selected and self-pollinated to advance to the next generation. RHA 443 also provides protection against metalaxyl-insensitive strains of downy mildew collected from sunflower production fields in North Dakota in 1998. Height of RHA 443 was 135 cm compared with 118 cm for RHA 426. Days to flower of RHA 443 was 67 compared with 71 for RHA 426.

Hybrids with the cytoplasmic male-sterile equivalent of HA 442 were produced by crossing with the restorer lines RHA 373 and RHA 377. Hybrids with the restorer line RHA 443 were produced by crossing with CMS HA 412 and CMS

HA 434. 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. Yield of hybrids with HA 442 and RHA 443 was 2327 and 2167 kg ha⁻¹, respectively, compared with a 2238 kg ha⁻¹ average of the three check hybrids. Oil content of hybrids with HA 442 and RHA 443 was 43.2 and 44.8%, respectively, compared with a 46.4% average of the three check hybrids. Oleic acid concentration of hybrids with HA 442 was 56.2% compared with a 59.0% average of the check hybrids. Height of hybrids with HA 442 and RHA 443 was 163 and 172 cm, respectively, compared with a 173 average of the three check hybrids. Days to flower of hybrids with HA 442 and RHA 443 was 67 and 69 d, respectively, compared with a 68 d average of the three check hybrids.

Limited quantities of seed of each germplasm are available from the Seedstocks Project, Department of Plant Sciences, Loftsgard Hall, North Dakota State University, Fargo, ND 58105. Seed of this release will be deposited in the 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 requested for HA 442 or RHA 443.

The release date for these germplasms will be on the date of final signature. Appropriate recognition should be made if this material contributes to the development of a new breeding line or cultivar.

Director
North Dakota Agricultural Experiment Station
Fargo, ND

Date

Administrator
Agricultural Research Service
United States Department of Agriculture

Date