



United States Department of Agriculture  
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UNITED STATES DEPARTMENT OF AGRICULTURE  
Agricultural Research Service  
Washington, D.C.

and

NORTH DAKOTA AGRICULTURAL EXPERIMENT STATION  
North Dakota State University  
Fargo, ND

**NOTICE OF RELEASE OF THREE CYTOPLASMIC MALE-STERILE  
SUNFLOWERS, CMS GRO1, CMS GRO1-RV, and CMS MAX3-RV**

The cytoplasmic male-sterility system is important for hybrid sunflower production. Unfortunately, the system is based on a single female cytoplasmic male sterile line, PET1. Diversification of new and different cytoplasmic male sterile lines is needed in the sunflower industry. An unusual cytoplasmic-nuclear interaction causing plants with reduced vigor has been observed, and a single dominant gene is needed to restore normal plant growth. A considerable number of cultivated lines were found to possess the vigor restoration gene. A recent discovery of a different vigor restoration gene derived from *Helianthus giganteus* suggested the existence of different vigor restoration genes in varying perennial *Helianthus* species, compensating for specific cytoplasmic effects causing reduced vigor. The new CMS lines are characterized by defective anthers, narrow disc florets with no swollen corolla, and short, narrow ray flowers. These unique CMS lines will facilitate studies of the incompatibility between cytoplasmic and nuclear genes, especially for alloplasmic CMS involving perennial species, and also will provide unique ornamental flower types and CMS sources for hybrid sunflower breeding.

CMS GRO1, CMS GRO1-RV, and CMS MAX3-RV have defective anthers, narrow disk florets with no swollen corolla, and short narrow ray flowers. CMS GRO1 is heterozygous for the dominant vigor restoration gene, segregating for normal and reduced vigor (RV) plants after backcrossing normal plants with HA 410. CMS GRO1-RV and CMS MAX3-RV do not possess the vigor restoration gene and only produce RV progeny when backcrossed with HA 410.

CMS GRO1 and CMS GRO1-RV were identified from BC<sub>3</sub>F<sub>1</sub> progeny of interspecific amphiploids (AMP) crossed with HA 410. They are BC<sub>4</sub>F<sub>1</sub> bulks with the pedigree of AMP *H. grosseserratus*/P21//5\*HA 410. CMS GRO1 is single headed (SH), plant height (PH) of 81 cm, flowers (DF) 80 days after planting, head diameter (HD) 16.4 cm, 1000-seed weight (SW) 79 grams, open-pollinated seed set (OP) of 37% indicating normal female fertility, and black seed with gray stripes. CMS GRO1-RV is SH, PH 36 cm, DF 83 days, HD 3.6 cm, SW 46.9 grams,

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Crop Production and Protection  
5601 Sunnyside Avenue • George Washington Carver Center  
Room 4-2200 • Mail Stop 5139  
Beltsville, Maryland 20705-5139  
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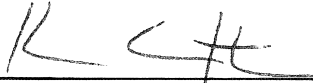
OP 37% indicating normal female fertility, and black seed with gray stripes. In comparison, the recurrent parent HA 410 was SH, PH 78 cm, DF 82 days, HD 14.4 cm, SW 75.3 grams, OP 39%, and seed black with gray stripes.

CMS MAX3-RV was identified from BC<sub>3</sub>F<sub>1</sub> progeny of interspecific amphiploids AMP H. maximiliani/P21 crossed with HA 410. It is a BC<sub>4</sub>F<sub>1</sub> bulk with the pedigree of AMP H. maximiliani/P21//5\*HA 410. CMS MAX3-RV is SH, PH 66 cm, DF 81 days, HD 10.6 cm, SW 70.3 grams, OP 19% indicating normal female fertility, and seed black with gray stripes. In comparison, the recurrent parent HA 410 was SH, PH 78 cm, DF 82 days, HD 14.4 cm, SW 75.3 grams, OP 39%, and seed black with gray stripes.


CMS GRO1, CMS GRO1-RV, and CMS MAX3-RV will be maintained by the USDA-ARS, Fargo, North Dakota with small quantities of seed of each genetic stock available from the North Dakota Foundation Seed Stocks Project, NDSU Dept. 7670, P.O. 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 CMS GRO1, CMS GRO1-RV, and CMS MAX3-RV.

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

**Signatures:**

  
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Vice President for Agricultural Affairs  
North Dakota State University

7/6/16  
Date

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

8/9/16  
Date