

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

and

UNIVERSITY OF CALIFORNIA
Riverside, CA

NOTICE OF RELEASE OF NH2168, Carrot

Introduction:

The United States Department of Agriculture, Agricultural Research Service and the California Agricultural Experiment Station announce the release of carrot inbred Nh2168 with resistance to *Meloidogyne incognita* and *M. javanica*, to provide germplasm for developing improved hybrids and breeding populations.

Trait Background:

This inbred has demonstrated consistent resistance to *Meloidogyne incognita* and *M. javanica* after five generations of selection. Resistance to *M. javanica* is largely conditioned by at least two loci (Simon et al., *Theor. Appl. Genet.* 100: 735-742. 2000; Ali et al., *J. Hered.* 105: 288-291. 2014) whereas resistance to *M. incognita* Races 1 and 3 is conditioned by several quantitative trait loci (Parsons et al., 2014). The precise resistance gene constitution of this inbred is yet to be determined.

Breeding and Selection History:

This inbred was developed from a sib-mating in 1995 among 4 plants of PI 652335, an open-pollinated carrot collected in Homs, Syria. Plants were grown in a winter nursery at the University of California (UC) Desert Research and Extension Center, El Centro, CA and selected for uniform purple exterior storage root color, with no selection for nematode resistance. Seed was produced from these selected plants to generate the M1 generation at the University of Wisconsin West Madison Agricultural Research Station. A second cycle of selection was made from the M1 generation in 1996, utilizing 6 selected plants to produce the M2 generation. Beginning with this M2 population, selection was carried out for five generations in fields at the UCR Coachella Agricultural Research Station, Thermal, CA, the UC Kearney Agricultural Research and Extension Center, Parlier, CA, and the UC South Coast Research and Extension Center, Tustin, CA, in plots heavily infested with *M. incognita*. The field in Thermal is infested with Race 1, while those in Parlier and Tustin are infested with Race 3. The Kearney and South Coast Centers also have separate plots infested with *M. javanica*, and resistance to attack by this nematode also was evaluated.

Seed Production History and Ancillary Evaluation:

Inbred Nh2168 was developed from nematode resistant selected roots for each generation after the M2. Resistant roots were relatively smooth and uniform for purple exterior and outer phloem color, orange or yellow in internal color (xylem and inner phloem). The population size used to generate the M3 generation was 11 plants, and 2-4 plants were used to generate the M4 and M4SM generations. Resulting seed subsamples generated from resistant carrots were also grown at the UC Desert Research and Extension Center, El Centro, CA, where evaluation of bolting tendency and horticultural attributes including appearance, flavor (sweetness and harshness), and internal root color and carotene content (to estimate contribution to vitamin A nutrition) was made. Preliminary

F1 hybrids with several petaloid cytoplasmic male sterile inbreds and hybrids have been produced to evaluate combining ability. CMS restoration has not been observed, suggesting this inbred is a CMS maintainer.

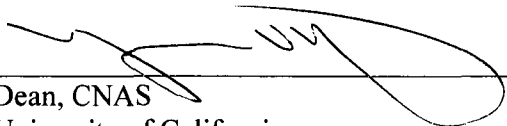
Root Appearance and Crop Performance:

Roots of Nh2168 are 14-17 cm long with a purple exterior and yellow or orange interior, cylindrical to slightly conical, ranging in smoothness, with relatively harsh flavor. Seed productivity is moderate to weak, and minimal tendency toward early bolting has been observed. This inbred displays a moderate level of resistance to *Alternaria dauci* (*Alternaria* leaf blight) based upon evaluations made under natural field exposure to this disease over 4 years in Wisconsin. Hybrids with nematode susceptible and other resistant inbreds have acceptable horticultural quality and appearance, and excellent nematode resistance.

Seed Request Instructions, Credit to the Selection Team, and Acknowledgements:

Seed of carrot inbred Nh2168 is available for distribution to plant breeders, geneticists, pathologists and other research personnel upon written request to Philipp W. Simon, USDA, ARS, Vegetable Crops Research Unit, Dept. of Horticulture, 1575 Linden Drive, Madison, WI 53706. Efforts of Philip A. Roberts and William Matthews of the University of California – Riverside in nematode resistance evaluation and steckling production, of Joe Nunez of the University of California Cooperative Extension, Bakersfield, CA, in field trialing, and of Robert Kane and Douglas Senalik of the USDA – ARS in seed production and carotenoid evaluation, respectively, as well as funding from the California Fresh Carrot Advisory Board (to PAR and PWS), USDA Specialty Crop Research Initiative award 2008-51180-04896 (to PWS and PAR) and USDA Organic Agriculture Research and Extension Initiative award 2011-51300-30903 (to PWS and PAR) are gratefully acknowledged. Seed samples of this release will be deposited into the National Plant Germplasm System where they will be available for research purposes including development and commercial production of new cultivars. It is requested that appropriate recognition be made if this germplasm contributes to the development of new breeding lines or cultivars.

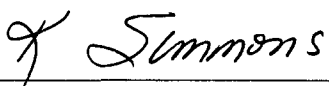
Signatures:



Dean, CNAS
University of California

12/9/14

Date



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

12/19/14

Date