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Research, Education, and Economics
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UNITED STATES DEPARTMENT OF AGRICULTURE
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Washington, D.C.

and

UNIVERSITY OF CALIFORNIA
California Agricultural Experiment Station
Davis, California

**NOTICE OF RELEASE OF CARROT INBRED L1408, L2575, L7553, and L9793
GERMPLASM**

The Agricultural Research Service, United States Department of Agriculture, and the California Agricultural Experiment Station announce the release of carrot inbreds L1408, L2575, L7553, and L9793 to provide germplasm for developing improved genotypes and producing long Emperor hybrids for 'cut and peel' or 'baby' carrot production.

In the early 1980's the open-pollinated carrot cultivar initially referred to as FN2-9 and released in 1985 as 'Apopka' was jointly developed by the USDA-ARS and the Florida Agricultural Experiment Station from the open-cultivated cultivar 'Hi-Color 9' by recurrent selection for uniform dark orange color, mild and sweet flavor, and long, smooth, cylindrical storage roots. A series of crosses was made between FN2-9 and USDA fresh market inbreds to improve color and smooth root surface, but derivatives were longer than acceptable for fresh market use as whole carrots. But by the early 1990's the 'cut and peel' or 'baby' carrot market was emerging, and long thin Emperor carrots were in demand and inbreds L1408, L2575, and L9793 (referred to as the L1408 series) was derived from a cross made in 1985 at the University of Wisconsin between FN2-9 and the USDA, ARS released inbred B2302. L7553 was developed from a cross between FN2-9 and the USDA, ARS released inbred B2566 in 1989. Progeny of FN2-9 x B2302 and of B2566 x FN2-9 were selected for longer roots in both crosses grown at the Desert Research Experiment Center (DREC) in 1998-1999 to initiate an effort to meet the needs of this growing market. F1 hybrids of these two crosses as well as 23 other long hybrids and inbreds from the USDA breeding program were vernalized, grown together in crossing cage 901 and randomly sib-mated with bluebottle flies at the West Madison Agricultural Research Station to yield the F1M generation. Beginning with the 2000-2001 crop grown at DREC, smooth roots from 20 of these 25 F1M crosses were selected for sweet, mild flavor and dark orange external and internal color. From 5-10 roots of each cross were allowed to sib-mate in a crossing cage to generate the F1M2 generation. A similar selection approach was used to intermate 18, 17, 11, 8, and 2 populations derived from these crosses, in the next 5 generations of selection, to generate two F1M7 populations.

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At this point in the breeding program, derivatives of the FN2-9 x B2302 cross were advanced with the same selection criteria for an additional 6 generations of sib-mating (designated as M) and self-pollination (designated as S) to the F1M7S3M3 generation, to yield inbred L1408. Starting with the same F1M7 population, two additional selections were grown and advanced separately with the same selection criteria for five additional generations to yield inbreds L2575 at the F1M8S2M2 generation, and L9793 at the F1M6S4M3 generation. Also beginning with seed from cage 901, the F1M population derived from B2566 x FN2-9 was advanced using the same selection criteria as was used for the L1408 series for seven additional generations, to yield L7553 at the F1M4S4 generation. L1408, L2575, L7553, and L9793 are maintainers of sterility ("B" lines), and petaloid cytotsterile counterparts ("A" lines) in the Cornell cytoplasm for each inbred are now at the BC3 to BC5 generation. These inbreds tend to flower mid-season and produce abundant pollen and seed.

Roots of these inbreds are smooth and cylindrical with uniform dark orange external and internal color, and 28-36 cm long and thin, 0.8-1.6 cm diameter when grown at the typical 3.75 – 4.75 million plants per hectare for cut and peel carrots. Root shape is nominally of the Imperator type but better referred to as Long Imperator, given its adaptation for producing cut and peel carrots. Roots have no green shoulders and small cores with uniform orange color across xylem and phloem, and with sweet and mild flavor, comparable to the three standard cultivars in trials. Tops are of average to somewhat smaller than average size, relative to typical cut and peel cultivars, with strong attachment to the root.

Alternaria leaf blight resistance is average to slightly above average, compared to more resistant cultivars like 'Bolero' or more susceptible cultivars like 'Heritage'. All of these inbreds have moderate cavity spot tolerance and no root-knot nematode resistance, but hybrid combinations with cavity spot resistant inbreds, like F7738, and with *M. incognita* nematode resistant inbreds, like Nbh2306, impart intermediate levels of resistance.

These inbreds were evaluated as parents in experimental hybrid combinations with each other and with other cut and peel inbreds from the USDA carrot program from 2016 to 2020 that included 65-95 other widely grown cultivars and advanced seed industry and USDA hybrids that included 'Propeel', 'Uppercut', and 'Imperial Cuts' as standards for comparison. Hybrids that included these long inbreds accounted for 3 or 4 of the top 10 entries in trials each year based on scores of appearances, judged by 35-50 carrot growers and seed industry personnel at the UC Desert Research and Experiment Center in Holtville, CA. F1 hybrids L1408 x L7553 and L2575 x L1408 serve as very good seed parents for testing Long Imperator parents in 3-way hybrid combinations.

Seed of carrots L1408, L2575, L9793 and L7553 are 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. Seed samples of this release will be deposited into the National Plant Germplasm System where they will be held for long-term storage. It is requested that appropriate recognition be made if this germplasm contributes to the development of new breeding lines or cultivars.

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Signatures:



Dean, College of Agricultural and Environmental Sciences
University of California

12/18/2023

Date

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

Date