A NEW SOURCE OF HAPLOID GERMPLASM FOR GENETIC AND BREEDING RESEARCH

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Abstract

Haploids were obtained from six tetraploid clones that were selected based upon either high or low specific gravity and low glucose accumulation during storage. Atlantic, Redsen, Red Pontiac, W 710, W 760 and W 842 had frequencies of 20.2, 13.9, 3.8, 6.3, 9.8 and 9.3 haploids/100 fruit, respectively. A total of 702 haploids was produced from: Atlantic (470), Redsen (54), Red Pontiac (2), W 710 (1), W 760 (134) and W 842 (11).

Resumen

Se obtuvieron haploides de seis clones tetraploides que fueron seleccionados en base a una alta o baja gravedad específica, y a una baja acumulación de glucosa durante el almacenamiento. Atlantic, Redsen, Red Pontiac, W 710, W 760 y W 842 tuvieron frecuencias de 20.2, 13.9, 3.8, 6.3, 9.8 y 9.3 de haploides/100 frutos, respectivamente. Se produjo un total de 702 haploides de Atlantic (470), Redsen (54), Red Pontiac (2), W 170 (1), W 760 (134) y W 842 (11).

Introduction

Haploids (2n=2x=24) from the tetraploid (2n=4x=48) cultivated potato, Solanum tuberosum Group Tuberosum provide unusual opportunities for genetic and germplasm studies. Hougas, et al. (5) initiated the production of haploids on a large scale by interploidy crosses between Group Tuberosum and Group Phureja. Hougas and Peloquin (4) emphasized two advantages of the use of haploids: (1) direct gene transfer from the wild and cultivated, tuber-bearing, 24-chromosome Solanum species, and (2) disomic rather than tetrasomic enhancement. Haploids have played an important role in germplasm
enhancement (2) and in cultivar development (7, 9). They have only been used to a limited extent in genetic studies. For example, in a genetic study involving morphological characteristics in the cultivar Chippewa (10). De Maine (1) used only 17 and 29 haploids from Record and Pentland Crown, respectively, to study the variation among haploids for six traits. Kotch and Peloquin (8) reported on variation patterns observed among haploids produced from three tetraploid clones for a number of tuber quality characteristics, including specific gravity and glucose accumulation.

Haploids must continue to be produced for genetic and breeding research. This paper is concerned with the production of haploids from tetraploid seed parents selected on the basis of either high or low specific gravity or low glucose accumulation during storage.

**Materials and Methods**

The six tetraploid seed parents from which haploids were produced were U.S.A. cultivars, Atlantic, Redsen and Red Pontiac, and Wisconsin advanced selections, W 710, W 760 and W 842. The six clones were selected based upon specific gravity or glucose accumulation. Atlantic, W 760 and W 842 are classified as high specific gravity clones (> 1.080), while Redsen, Red Pontiac and W 710 are classified as low specific gravity clones (< 1.065). Atlantic and W 842 also accumulate very low levels of reducing sugars during storage.

Haploids were produced by interploidy pollinations between the tetraploid seed parents and diploid Group Phureja clone 1.22, a superior diploid pollinator from PI 225682 commonly used in haploid extraction. The pollinator is homozygous for a dominant seedling marker (PP) for purple hypocotyl, which facilitates the identification of haploids among the progeny of the interploidy crosses. The decapitation technique was used in all crosses to promote fruit retention with limited seed set (11, 13).

The seeds resulting from the interploidy crosses were planted in potting soil, and after two to three weeks only the seedlings with nonpigmented hypocotyls were transplanted to 7.6 cm clay pots. Prospective haploids were identified based on length-breadth ratio of the terminal leaflet and a lighter green color characteristic of most haploids. The ploidy level of this material was determined by chromosome counts made from acetocarmine root tip squashes. Haploid frequency is reported as haploids/100 fruits. A 2 x 2 chi-square contingency test was used to test the difference of haploid frequencies among years and among clones.

**Results and Discussion**

Fifty-four haploids were identified in 1984, resulting from 1,134 interploidy pollinations which yielded 460 fruits with 377 seeds. Haploid frequencies (haploids/100 fruit) for the six seed parents were 10.0 for Atlantic, 13.3 for