POTATO SELECTION FOR HIGH DRY-MATTER IN SEEDLING GENERATION

S.L. Lam and R. Grenard

Abstract

Potato selection for high dry-matter can be made in the first-year seedling generation reducing the time required to complete a breeding cycle to one year. Yielding capacity of first-year seedlings can be as good as that of plants from tubers of clonal generation and from commercial varieties.

Resumen

En un programa tradicional de mejoramiento de papa, la selección inicial para material seca es generalmente hecha 3 a 4 años después de la hibridación. De 1973 a 1975, más de 20,000 plantulas procedentes de cruces entre 4 variedades comerciales y 4 clones seleccionadas, fueron investigados. Los resultados indican que la selección de papa para materia seca alta puede ser efectuado aún en el primer año de la generación de plantulas.

El tiempo requerido para completar un ciclo de mejoramiento puede ser acortado a un año cuando plantas de papa de semilla verdaderas, son crecidas bajo conciciones de campo. La capacidad de rendimiento de plantulas del primer año pueden ser tan alta como de plantas de tubérculos de generación clonal y variedades comerciales.

Introduction

Good quality of processed potato products is dependent on high dry-matter content of tubers. In the traditional potato breeding procedure, seedlings from true seeds are generally raised in pots in greenhouses, planted as single hills in the field the following year, with initial selection for dry matter made about 3-4 years after hybridization. In speeding up potato breeding programs, many breeders have tried to make initial selection for general characteristics in the early clonal generation on a one-plant basis. However, many have questioned if performance of the true seedling generation differs from that of later clonal generations (1, 2, 3).

This paper describes a breeding procedure by which selection for dry-matter can be made even in the first-year seedling generation and the time required for a breeding cycle can be shortened to a year.

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Materials and Methods

Four commercial varieties (Superior, Cobbler, Norland, and Red Pontiac), four selected clones (Wis 634, ND 7196, 66-142, and 66-159), and one Chacoense tuberosum hybrid were used as parental materials in the present investigation. Shoots of parental plants were grafted on tomato stocks from December through January in the greenhouse to enhance flowering and fruit set. As soon as potato scions reached 4-6 inches long, the grafted plants were moved into the growth chamber with 18 hours of light, temperatures of 60°F (night), 70°F (day); light intensity was about 2,000 ft-c. Grafted potato plants under such conditions bloom profusely and set fruits readily. Pollination among different parental plants was made from December through March. Once fruit set occurred grafted plants were moved out to the greenhouse for ripening. Seed balls were harvested about 1½ months after pollination. True seeds of potato were generally sowed in the first week of April. For enhancing seed germination, recently extracted seeds were soaked in .36% solution sodium Hypochlorite (7% Chlorox) and rinsed immediately with water for 15 minutes. Potato seeds were then treated with 100 ppm of gibberellic acid (GA) for 2-3 days in the cold room at a temperature of 50°F (4, 5). Immediately after the GA treatment seeds were sown in a small flat and covered with black cloth in the growth chamber with temperature and light conditions as mentioned above. About two weeks after germination, seedlings were ready to transplant to Jiffy pots and were placed on greenhouse benches for normal growth and development. Seedlings were transplanted directly to the field by the middle of May. They were planted 1 ft apart with 3 ft between rows (except in 1973 when they were planted in open benches with 3 in. between plants).

Prior to transplanting to the field, seedlings were generally moved outdoors for the hardening process. Irrigation and fertilizer were provided as needed. Tubers of field-grown progeny seedlings were harvested individually by hand from the middle of August through the first week of October. Tubers were tested individually for specific gravity immediately after harvest. In determination of specific gravity, each tuber was passed through a series of salt solutions with different specific gravities of from 1.04 to 1.12 at 0.02 intervals. All tubers were separated into five classes, designated from 1 to 5, when they just began to float in a particular salt solution. They were rinsed in running water before drying. In general, 3 tubers from each seedling were tested for specific gravity. Tubers of selected clones of good quality were then treated with 0.1% (by volume) of ethylene chlorohydrin for enhancing the sprouting process. Shoots of promising clones were then grafted on tomato stock for another breeding cycle the following year.