SELECTION OF CLONAL POTATO SEEDLINGS AT THREE WIDELY SEPARATED LOCATIONS

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In the Canada Department of Agriculture all potato breeding, except for wart resistance, is done at the Research Station, Fredericton, New Brunswick (3). Most of the cooperating stations across Canada receive potato seedlings which have been selected in three years of field trials at Fredericton but some true potato seed and unselected greenhouse-grown tubers are also distributed.

It has been questioned from time to time whether one station could do the initial selecting for the wide range of latitudes and climatic conditions that exist in Canada. A study at the Fredericton Potato Sub-Station, Alma, New Brunswick, and the Crop Research Station, Preston, Ontario has shown that the “differences were due to the basis of choice used by the observer according to the needs and conditions of the respective region, and the difficulty inherent in making selections on a one-plant basis” (1).

The following study was undertaken to determine: (i) if the selectors at Fredericton were discarding seedlings which were better adapted to prairie conditions than those selected for conditions in New Brunswick, and (ii) if location affected the expression of several characteristics used in the initial selection of seedlings.

MATERIALS AND METHODS

Thirty-five unselected seedlings from each of the six crosses listed below were numbered and grown at the Potato Sub-Station, Alma, New Brunswick (45° 33'N, 65° 00'W, elevation 450'), the Research Station, Beaverlodge, Alberta (55° 13'N, 119° 27'W, elevation 2450'), and the Experimental Farm, Scott, Saskatchewan (55° 22'N, 108° 46'W, elevation 2164').

Late x Late

4146 — (1256A(23 x K113-1) x B606-37 x (Green Mountain x Arnica x Earlainex))
4165 — Katahdin x Saco

Early x Late

4175 — (Epicure x #46952 U.S.D.A.) x Saco
4185 — (Solanum demissum x Earlainex x Katahdin 6 times) x Wis. 143-52

Early x Early

4190 — S50-3 x K113-1
4191 — Irish Cobbler x K113-1

These were grown in two replicates of two plants each with 30 inches between plants and 36 inches between rows. Normal insect and disease control measures were carried out.

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In 1964, investigators at each location rated each of the 210 seedlings in each replicate as to foliage, maturity, stolon length, tuber type and general evaluation. Foliage was rated as normal or abnormal and all other characters were rated on a 1 to 5 basis. A total rating for each seedling was determined by adding the individual ratings for maturity, stolon length, tuber type and general evaluation. The 35 seedlings within each cross within each replication were then ranked on the basis of "total rating." The number of tubers 2½ inches and over, and under 2¼ inches was also recorded. Each location selected the best seedlings from this evaluation. The values of Spearman's Rank correlation coefficients adjusted for tied rankings (5) were determined between: (i) pairs of locations based on total rating, (ii) pairs of locations based on number of tubers, and (iii) on replicates at each location based on number of tubers.

In 1965, selections made at all three locations in 1964 were grown in 10 hill plots, replicated three times. Each seedling in each replicate was rated for the same characters except foliage, as previously, and also for specific gravity as determined by the weight-in-air weight-in-water method (2). Relationships between replicates and locations were examined by means of simple correlations (4) and rank correlations adjusted for tied rankings (5).

RESULTS

The Spearman's Rank correlation coefficients between replicates at one location and between the means of both replicates at different locations in 1964 showed that there is no better agreement between seedling ratings at one location than there is between different locations (Tables 1 and 2). Of the 43 selections (37 at Fredericton, four at Beaverlodge and two at Scott) two were selected at more than one location resulting in 41 different seedlings being retained.

Of the 37 selections made at Fredericton 10 were made in both replicates while the remainder at Fredericton and those at Beaverlodge and Scott were made in only one replicate.

In 1965, 41 selections were planted but two were later rogued for disease.

Agreement between replicates at Fredericton for all characteristics maturity at both locations, and total number of tubers and general evaluation at Scott, the agreement between replicates at both Scott and Beaverlodge generally was better than between locations (Tables 3 and 4). Except for Scott was no better than between locations.

In 1965, 30 selections were made, eight each at Fredericton and Scott, and 14 at Beaverlodge. Three of these were retained at all locations and five at two locations resulting in 19 different seedlings being retained.

Of the 14 selections made at Beaverlodge in 1965 only one had been selected there in 1964, two of the selections were made in all three replicates, eight in two replicates, and four in only one replicate. Seven of the 14 also were selected at Fredericton and four at Scott in 1965.