COMBINING ABILITY FOR SEEDLING VIGOR IN Bromus inermis Leyss

Laren R. Robison and H. L. Thomas

SEEDLING vigor is an important consideration in smooth bromegrass breeding. Research on seedling vigor has been primarily concerned with genotypic differences in days to emergence, number of seedlings emerged, seedling height, and seedling weight. There have been no previous studies reported concerning combining ability for seedling vigor.

The purpose of this investigation was to study combining ability for seedling vigor using seedling weight as a measure of seedling vigor.

Materials and Methods

In 1959, 47 clones established in a polycross nursery at Rosemount, Minn., were evaluated for prepotency for seedling vigor. Clonal evaluation was based on seedling performance, in the field and greenhouse, of the 47 polycross progenies and the open-pollinated progenies of the polycross progenies. The seedling nurseries were planted in four replications of a split plot design with main groups of seed as whole plots and generations as subplots.

Generations within whole plots were represented by 20 seeds each. In the field, rows of seeds were planted 3 feet apart on carefully leveled ground. Seeds within rows were planted 6 inches apart and 3/4 of an inch deep. Six weeks after planting, seedlings were harvested, dried, and weighed to compute average weight of shoots. An identical experiment was conducted in the greenhouse at St. Paul, with the exception that seeds were planted in paper cups—a single seed per cup.

From information obtained in the 1959 field and greenhouse seedling studies, 4 clones differing in prepotency for seedling vigor were selected from the polycross nursery to study combining ability for seedling vigor. Progenies of diallel crosses including reciprocals among the four clones were used in the study. During the summer of 1960, crosses were made by hand in the field. That fall the progenies were grown in seedling vigor nurseries in the field at Rosemount and in the greenhouse at St. Paul. The field and greenhouse nurseries were arranged in four replications of a split plot with progenies of crosses, reciprocal crosses, and open-pollinated progenies of polycrosses as whole plots and individual F1's within each of the three groups as subplots. Individual crosses were represented by 40 seeds in each replication. Seeds were planted as previously described for other seedling nurseries. Six weeks after planting, seedlings were harvested. Soil was removed from roots by gently spraying with water. Roots were excised from shoots and the material placed in a drying oven. Average weight of roots, shoots and total plants was computed for each of the seedling progenies.

The weights of roots, shoots, and total plants were criteria of seedling vigor. Estimates of general and specific combining ability for these three characters were interpreted as estimates of general and specific combining ability for seedling vigor. Analyses of variance were used to study field and greenhouse data. Analyses of variance and estimates of combining ability were computed according to method three of Griffing.

Results

A correlation coefficient of .54, significant at the 1% level, was obtained between polycross progenies and open-pollinated progenies of polycross progenies in the 1959 seedling vigor studies.

The 4 clones selected for diallel crosses were designated 43, 72, 61, and 77. Clones 43 and 72, high in prepotency