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NATURE OF GENE ACTION IN PHENOTYPIC RECURRENT SELECTION WITH BIRDSFOOT TREFOIL

Three populations of birdsfoot trefoil (L. corniculatus L.) were advanced by phenotypic recurrent selection for six cycles. Excellent progress was made in improving the average vigor and crown and root rot tolerance of the plants in successive cycles of selection. Consequently, it was decided to make diallel crosses among random clones from each population to test the mode of inheritance of several characters. Six clones from each population were intercrossed in the greenhouse in 1969 and 1970. Resulting diallel crosses were grown in 1970-1971 for group 'A'. Difficulty was experienced with certain crosses so that populations 'B' and 'H' were not grown until 1971 and 1972. Growing conditions were only fair for group 'A' with much below average rainfall in 1970, the establishment year. Group B and H had somewhat better growing conditions than group A. The field planting for group A consisted of 5 replications of 12 plant plots per cross whereas group B and H were tested in 6 replications of 8 plant plots. All plants in a plot were harvested together with the total number of plants noted. Data were put on an individual plant basis before being analyzed. The computer program of Littlewood et al (Crop Sci. 4: 662-663) was used in reducing the data.

Significant or highly significant general combining ability was noted in group A for early vigor in 1970 and in 1971 for first, second and total yield as well as for percent survival. Only late vigor displayed specific combining ability effects. Group B had significant or highly significant general combining ability effects for first, second, third and total yield in 1972 as well as disease score and percent survival. However specific combining ability was also present for second, third and total yield in 1972. Group H had highly significant general combining ability for first, second, third and total yield as well as percent survival in June and July with no specific combining ability noted.

From these experiments, it is obvious that general combining ability is more important for most characters than specific combining ability. Since general combining ability is generally regarded as additive in nature, its presence in populations undergoing phenotypic recurrent selections is important because rapid progress could be made only if additive effects are present. This also gives support to the practice of using the synthetic variety or pooling desirable germ plasm for improvement of a cultivated species. Characters with low heritability would not be easily improved by the phenotypic recurrent selection procedure.